UNITED STATES DEPARTMENT OF AGRICULTURE

THE AGRICULTURAL SITUATION IN SAN FERNANDO VALLEY, CALIFORNIA

By

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A Contribution From

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CONTENTS

INTRODUCTION

This is a report by the Division of Irrigation, Bureau of Agricultural Engineering, United States Department of Agriculture. It describes the results of a survey of the conditions affecting agriculture in San Fernando Valley, Los Angeles County, California, as they existed in the autumn of 1938, including the costs of producing the crops there raised, with special reference to the cost of water necessary for irrigation. Its general purpose was to provide a basis for considering the future of agriculture in the valley. In that connection it was preliminary to an intensive study provided for by an agreement between Geo. R. Boyd, Acting-Chief, U. S. Bureau of Agricultural Engineering, and H. A. Van Norman, Chief Engineer and General Manager, Los Angeles Bureau of Water Works and Supply, under operation of which the best methods of irrigation in the valley will be determined by experiments and actual demonstrations extending over several seasons.

Associated with the Bureau of Agricultural Engineering in the examination of costs of crop production was the Extension Service of the College of Agriculture, University of California, as represented by M. B. Rounds, the Los Angeles County Farm Advisor, and his assistants. Essential data on many subjects were contributed by D. A. Lane and his staff in the Division of Ground Water and Development of the Bureau of Water Works and Supply, and a special study of taxation was made by E. F. Rybolt and U. M. Jones, under direction of Clarence S. Hill, Right of Way and Land Agent, Los

Angeles Department of Water and Power. The author also received special assistance from Harry F. Blaney, Irrigation Engineer, and Dean W. Bloodgood, Associate Irrigation Engineer, Bureau of Agricultural Engineering; Guy E. Marion, Manager of Research Department, Los Angeles Chamber of Commerce; the Automobile Club of Southern California; the Los Angeles County Agricultural Commissioner; Los Angeles County Farm Bureau; Los Angeles County Regional Planning Commission; various cooperative marketing associations; the Federal-State Cooperative Crop Reporting Service, and various other Federal, State, County, and City officials whose files contained many data pertinent to the subject of the survey.

The work was initiated at the request of the Board of Water and Power Commissioners of the City of Los Angeles, which jointly with the Bureau of Agricultural Engineering, supplied the funds necessary for its support. The study was started September 6, 1938, and completed early in the following winter.

GENERAL CHARACTERISTICS

San Fernando Valley, northern-most portion of Los Angeles, California, comprises about two-fifths the area of the city.[1] Because the area is so large and so situated, it is unique in its combination of urban and rural characteristics.

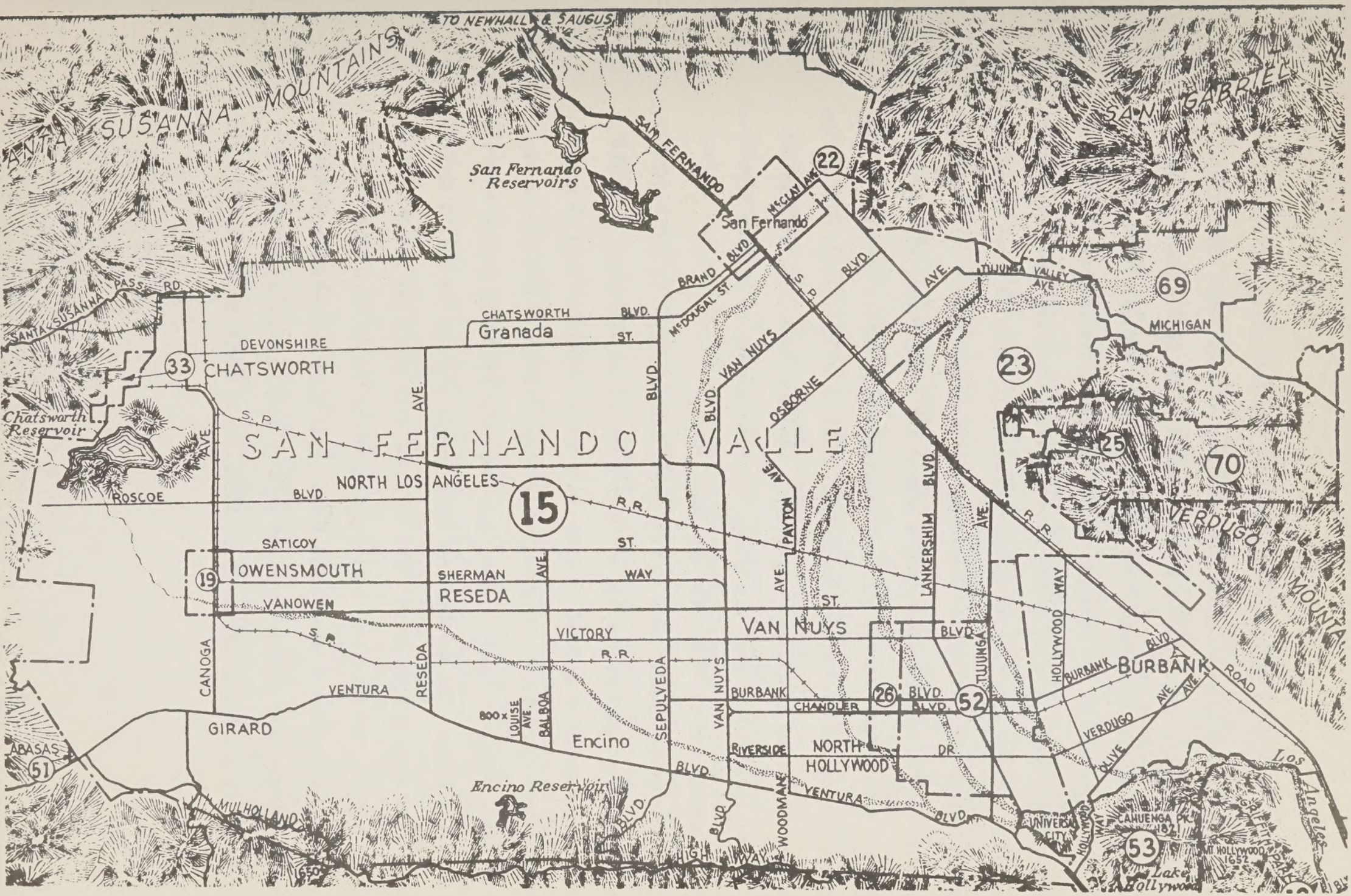
Location and Geography[2]

The Valley is a mountain-inclosed basin[3], the sides and floor of which are covered with material laid down in coalescing alluvial fans by streams issuing from the mountains. On the south the Santa Monica Mountains lie between it and the Pacific Coast, which they roughly parallel. Cahuenga Peak, near the southeastern corner of the Valley (elevation 1,825 feet) and Calabasas Peak, near the southwestern corner (elevation 2,169 feet), are the highest points of this range. Between them the crest of the range has a general east-and-west direction, with elevations ranging from about 1,000 to 2,000 feet. On the south, the break to the valley floor is sharp, and in general it follows regular lines. A large part of the adjacent hills is rough and broken and unsuitable for agriculture, but substantial areas of the more gentle slopes are tillable. A strip of mountainous country 6 or 7 miles wide intervenes between the southwestern part of the valley and the ocean, but farther east the coast line trends southward and the Santa Monica Range narrows.

1/ Burbank and San Fernando, although geographically in the Valley area, are not parts of Los Angeles. Unless otherwise indicated, they are not covered by the descriptions and discussions in this report.

2/ See "Soil Survey of the San Fernando Valley area, California", United States Bureau of (Chemistry and) Soils, 1915, from which much of this chapter and parts of later discussions of soils and early agriculture have been abstracted, edited and changed where appropriate or necessary for the present purpose, by the author.

3/ See Fig. 1.



SAN FERNANDO VALLEY CALIFORNIA
THE BROKEN LINE MARKS THE BOUNDARY OF THE CITY OF LOS ANGELES

FIGURE NO. 1

The valley is bounded on the west by the Simi Hills and some minor ridges, the greater elevations of which average about 2,000 feet. At the northwest, Santa Susana Pass, at about 1,600 feet elevation, leads into Simi Valley. The Santa Susana Mountains rise abruptly from the northwestern part of San Fernando Valley to elevations of more than 3,000 feet. Their lower margins extend into the valley through some intermediate elevations occupied by eroded younger formations. Some of these lands are agricultural. The valley is bounded on the northeast by the western extension of the San Gabriel Mountains, a rugged and rocky range, with elevations of over 4,000 feet. One of the most prominent topographic features of the outlying areas is the Verdugo Mountains. This is an oval range east of the valley. Its trend is southeast-northwest. About 9 miles long by 3 miles wide, it rises boldly from the valley floor to elevations of over 3,000 feet. It is largely rough, stony, and nonagricultural.

The valley itself is a somewhat oval basin, tilted to the southeast, with its trough much nearer the southern than the northern edge. The rim is fairly regular in general outline, with minor irregularities at points where ridges jut into the main valley or minor valleys recede within the hill line. Sharp changes in topography separate the basin slopes from the encircling hills. The northern or upper margin adjoins the hill line at elevations ranging from about 1,000 to 1,500 feet above sea level for most of its length, but the minor valley lying behind the Verdugo Mountains reaches an elevation of over 2,000 feet. From this northern margin the surface slopes away to the south and east by long, gradually decreasing gradients to the trough of the basin along its southern edge. Most of the

alluvial filling of the valley has been accomplished by streams entering its northern side, and their varying activities have resulted in modifications of the valley slopes within their influence. In the northwestern part the slopes are rather uniform and gradual. The north-central part has some steep alluvial fans around the base of the mountains, which soon flatten to the normal slope of approximately 40 to 70 feet per mile. Some steep fans are in the Sunland and Burbank regions, lying respectively, on the north and south sides of Verdugo Mountains. Relatively little filling has occurred from the west and south sides of the valley, the deposition of material from the north having lengthened the slopes so that in the southeastern area they reach entirely across the valley, their lower extensions adjoining the southern hill line. Farther west a narrow belt of low coalescing fans has been built by streams from the Santa Monica Mountains and the hills west of the valley. Elevations of the southern margin of the valley floor range from about 500 to 850 feet, while the trough has a southeastern elevation of about 500 feet and an elevation of about 800 feet at Canoga Park, in the western part.

The surface, as a whole, is without many sharp breaks or irregularities, since the steep parts of the fans give way gradually to their more gentle slopes, and individual fans merge almost imperceptibly with others. However, the continuity of the valley slopes and floor is broken in several places by low hills or ridges plainly differing in character from the main valley floor. Such hills and ridges occur in the southern and western parts of the area and between North Los Angeles and San Fernando, with still more prominent developments west and north of San Fernando and

east of Pacoima. Some of these, together with others elsewhere, are remnants of older valley surfaces. These constructional surfaces, made up of an aggregate of alluvial fans and the destructional surfaces described above as comprising the eroded upland or mountainous outer margins, not only differ in topography but represent two main provinces of soil-forming material.

Soils

The soils of San Fernando Valley are identified with three main provinces or groups of soil-forming materials, which differ not only in origin, mode of formation, and other features, but are further differentiated by rather striking contrasts in topography and in the character of the underlying material. The soils of the first group are derived from the weathering and disintegration in place of consolidated rocks, and are designated as residual. Those of the second group are derived from the weathering and modification of old unconsolidated water-laid deposits, designated as coastal-plain and old valley-filling soils. Those of the third group have been deposited as recent alluvium on valley slopes and floors without appreciable subsequent weathering or internal modifications, and are designated as recent-alluvial soils.

As regards location and topography, the first group is coextensive with the hilly or mountainous belt encircling the valley. The second group occupies low hills, ridges or remnants of older valley surfaces which sometimes are detached from the surrounding mountains, but more often occur as low projecting shoulders or fragments of old alluvial fans around the valley's edge, and are intermediate in elevation between the first and third groups. The third group, by far the most important both in extent and agricultural value, covers all the central part of the valley

as broad coalescing alluvial fans forming its sides and trough.

These soils were surveyed by the United States Bureau of (Chemistry and) Soils in 1915 and delineated on a map accompanying the report of the work. In 1936 the California Agricultural Experiment Station applied the Storie Index to the delineation, producing thereby a relative measurement of the agricultural value of the principal soils of the valley. 1/ While the survey itself and the later evaluation represented some soils outside the area now under consideration, the Storie Index map of the area (Fig. 2) shows clearly the location of the strictly valley lands.

The soil survey covered 175,360 acres, of which 71,808 acres are included in Grade 1 by the Storie Index; 18,240 acres are in Grade 2; and 24,192 acres are in Grade 3. The "grades" are defined by Weir and Storie as follows:

"Grade 1, index rating 80 to 100: Excellent soils -- above the average in all respects; suitable for a wide range of crops, including alfalfa, truck and field crops, orchards, vineyards, capable of intensive development under irrigation.

"Grade 2, index rating 60 to 79: Good soils -- usually suitable for most crops of the region, although not quite so desirable nor of so high general value as the soils of grade 1 because of heavier-textured or lighter-textured types, heavier-textured subsoils, slight accumulations of alkali, etc.; capable of development under irrigation.

1/ "A Rating of California Soils" by Walter W. Weir and R. Earl Storie. Bul. 599, Agricultural Experiment Station, College of Agriculture, University of California, January, 1936.

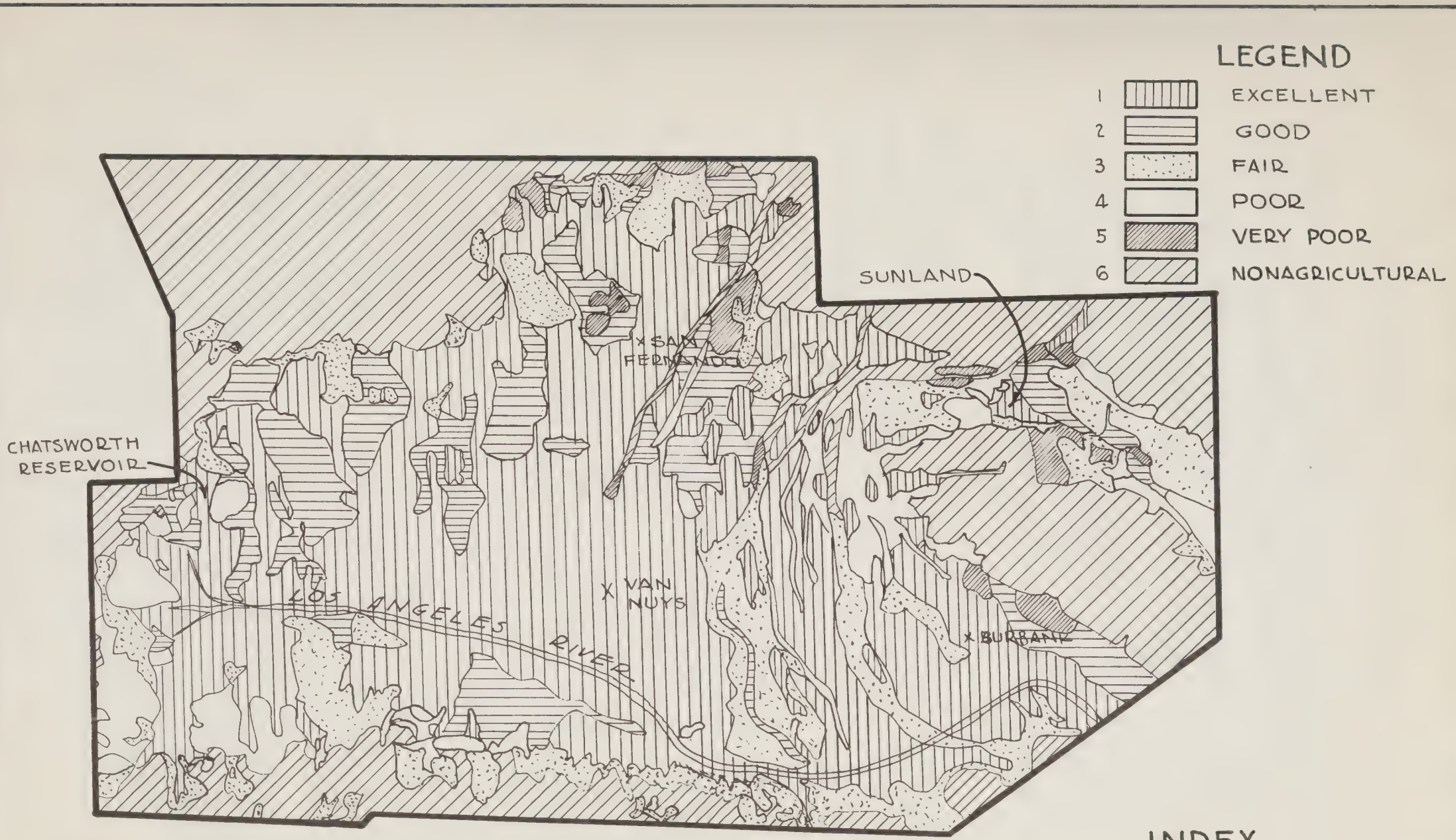
"Grade 3, index rating 40 to 59: Fair soils -- will produce many crops but limited in their use and productivity by extremes of texture, heavy-textured subsoils, drainage, hardpan, erosion, bedrock, alkali in moderate amount, or other soil factors. Soils in this grade may give good or even excellent results with certain specialized crops or where climatic conditions are peculiarly favorable, but they do not have the range in suitability of soils in grades 1 and 2.

"Grade 4, index rating 20 to 39: Poor soils -- soils suitable for a few crops and these often of poor quality. They have a very narrow range in agricultural possibilities because of heavy texture, alkali, poor drainage, infertility, hardpan or bedrock at relatively shallow depths, or other adverse soil conditions. Some soils in this grade may be improved by artificial means such as drainage and alkali reclamation.

"Grade 5, index rating 10 to 19: Very poor soils -- soils of very limited use except for poor pasture, because of extremely adverse conditions such as alkali, shallowness, stoniness, roughness, etc. This grade of soil is essentially nonarable.

"Grade 6, index rating less than 10: Nonagricultural areas -- includes such areas as are mapped in the soil survey as rough mountainous land, rough stony land, scabland, riverwash, tidal marsh, etc."

As disclosed by Fig. 2, the soils of best quality from the standpoint of agriculture lie most compactly in the west-central portion of the valley; that is, beyond the influence of the washes between Burbank and Van Nuys (Fig. 1).



INDEX
OF
VALLEY SOILS
(FROM STORIE'S INDEX MAP)

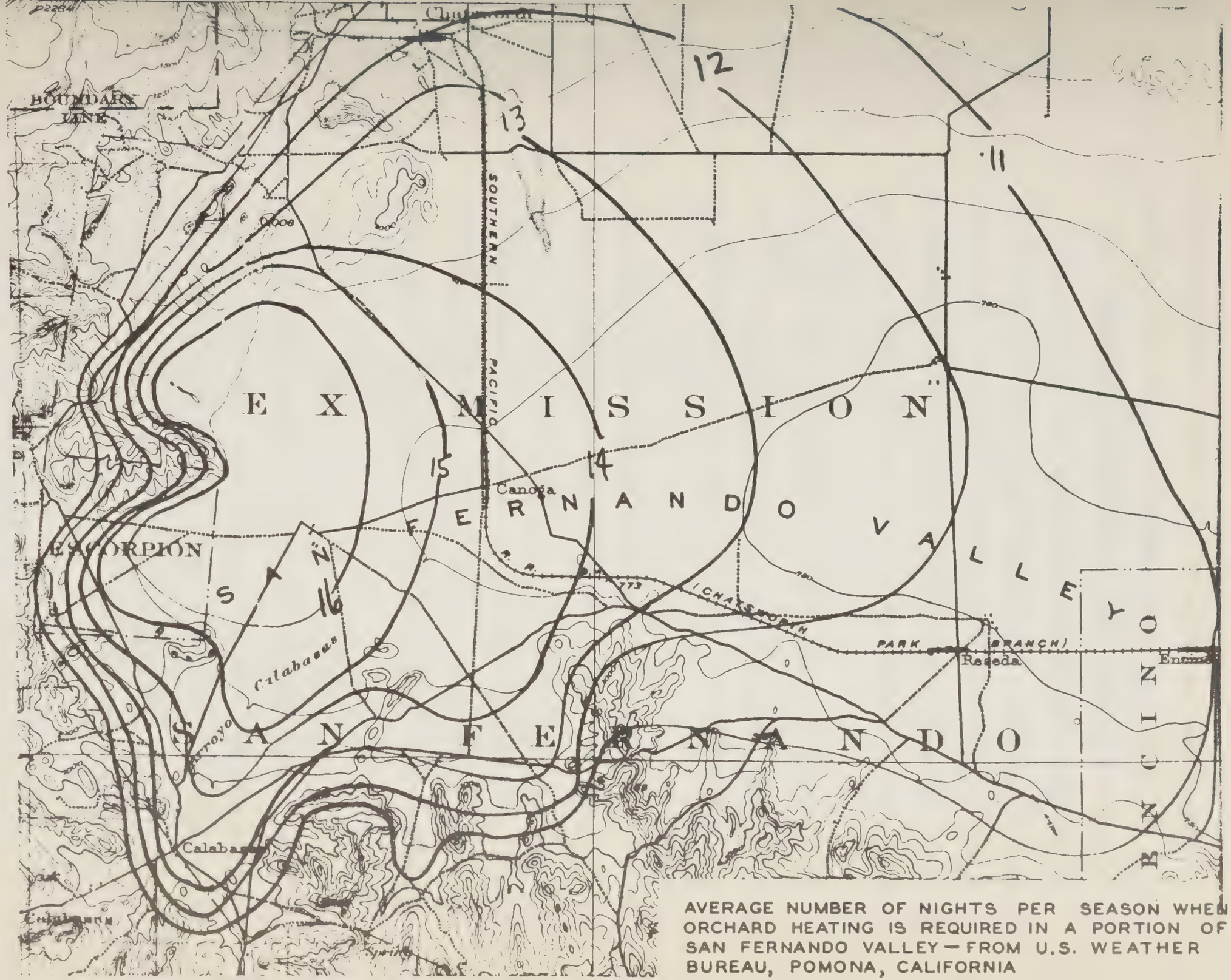
FIGURE NO. 2

Climate

San Fernando Valley winters are wet and cool, and the summers are dry, with greater extremes of temperature from winter to summer than those characterizing many other sections of the State. The variations in rainfall are also wide, as are the occurrences of fog and other features, so that climatic conditions are different in different localities. These local differences are sometimes sensibly greater than might be inferred from a comparison of general climatic data.

Temperatures and frost conditions vary sufficiently to influence the distribution of citrus orchards and other agriculture. The northern, more elevated side of the valley along the base of the inclosing mountains is, in general, warmer and more nearly free of frosts than those farther down. This condition is illustrated by Fig. 3, which shows, by zones, the average number of nights of orchard heating required per season in the western portion.

The central and lower parts of the valley are at times swept by strong winds. The windy periods usually are not of long duration, but if accompanied by excessive heat and dryness they constitute a serious hazard to some existent types of agriculture, especially the orchards. Temperature variations and rates of evaporation are, in fact, notably affected by the valley winds, and windbreaks of eucalyptus, cypress and other trees are numerous. Nevertheless, the climate of the valley is well suited to most of the many crops grown there. It is generally agreeable and healthful, with few unpleasant features aside from the winds and occasional excessive temperatures in summer.



AVERAGE NUMBER OF NIGHTS PER SEASON WHEN ORCHARD HEATING IS REQUIRED IN A PORTION OF SAN FERNANDO VALLEY — FROM U.S. WEATHER BUREAU, POMONA, CALIFORNIA

FIGURE NO. 3

Table 1 shows the extreme and mean monthly, seasonal and annual temperatures at Van Nuys, where a meteorological station is maintained by the city of Los Angeles Bureau of Water Works and Supply.

The average date of the last killing frost in spring, at San Fernando [1/], is February 15; average date of first killing frost in autumn, December 18. The average length of the growing season is thus 306 days. The latest date of killing frost in spring was recorded on April 5, and the earliest date of killing frost in autumn was October 21.

The Bureau of Water Works and Supply maintains rain gages at a number of typical places in the valley. Records from these stations indicate the monthly precipitation averages for the valley shown in Table 2.

As shown by Table 2, nine-tenths of the yearly precipitation comes in the six months November to April (of the average year), the small remainder being ineffective as far as benefits to crops are involved. On the other hand, the late winter and early spring precipitation is substantial if not excessive to the point of producing floods, and is ordinarily capable of providing for the moisture needs of crops well into their growing season.

Drainage, Floods and Flood Control

San Fernando Valley is drained by Los Angeles River. Its tributaries, the Tujunga, Little Tujunga, and Pacoima Creeks, have their sources in the western part of the San Gabriel Mountains. The first two emerge from their

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1/ United States Weather Bureau record for 13 years ending with 1930.

Table 1.-- Extreme and Mean Monthly, Seasonal and Annual Temperatures at Van Nuys, Calif. (8-year record ending with 1937) 1/

Month	Absolute Maximum	Absolute Minimum	Mean
	°F	°F	°F
December	87	24	52.7
January	92	22	51.8
February	95	26	55.3
Winter	95	22	53.6
March	98	28	59.9
April	101	30	61.8
May	102	32	64.4
Spring	102	28	62.0
June	107	42	68.5
July	116	45	74.8
August	111	46	74.7
Summer	116	42	72.7
September	107	40	69.8
October	107	29	64.7
November	96	29	58.6
Fall	107	29	64.4
YEAR	116	22	63.2

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

Table 2. -- Monthly precipitation in San Fernando Valley, Calif., for the years 1927-28 to 1936-37. 1/

Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
1927-28	--	--	--	1.79	.86	3.03	.01	2.59	2.03	.37	.57	.01	11.26
1928-29	--	--	--	.28	1.60	2.22	1.65	1.82	1.35	1.96	--	.05	10.93
1929-30	--	--	.47	.08	--	--	5.56	.74	4.17	.39	.71	--	12.12
1930-31	--	--	.01	.34	2.13	--	3.55	5.57	.01	2.50	.50	--	14.61
1931-32	--	.20	.12	.13	2.62	6.33	2.14	6.99	.10	.62	.18	.10	19.53
1932-33	--	--	.15	.11	--	1.19	9.58	--	.13	.45	.15	.37	12.13
1933-34	--	.04	--	.27	.01	4.84	4.88	2.33	.03	--	--	.50	12.90
1934-35	--	--	.05	1.48	2.40	4.46	3.25	1.60	3.36	2.07	.02	--	18.69
1935-36	.03	.12	.06	.20	1.16	.64	.42	7.42	1.38	.58	--	.02	12.03
1936-37	.02	.01	.01	1.89	.01	6.49	2.92	6.35	4.52	.31	.18	--	22.71
Average	.02	.09	.12	.66	1.35	3.65	3.39	3.93	1.71	1.03	.33	.17	14.69

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

canyons in the northeastern part of the valley and join on the upper valley slopes to form Tujunga Wash. The broad, stony bed of this stream swings a little westward around the Verdugo Mountains through subdividing indistinct channels which then trend southeastward. Many of these shifting surface washes further subdivide and disappear on the sandy slopes, while others continue, as distinct sandy channels, to the river. Pacoima Creek, known as Pacoima Wash after it emerges on the valley slopes, occupies a broad, stony bed just east of San Fernando and continues southwestward until well down the valley slopes, where it turns southward and gradually disappears in dividing channels.

In addition to these streams there are many small creeks, averaging almost one to every mile. These streams discharge around the edge of the entire valley, and almost all disappear soon after leaving the hills. The larger creeks, together with a number of the smaller streams, sometimes overflow their fan deposits, but the drainage of the valley, except during short periods when the streams are at flood stage, is largely by subsurface flow. In fact, an important and successful effort is made by the Los Angeles Bureau of Water Works and Supply to encourage this underground diversion by the provision of water-spreading works. Water so sent to natural storage is later recovered by pumping and is thereby added to the municipal supplies. The trough of the valley in its western third does not contain an open, well-defined waterway, but beginning near Reseda, a shallow stream rising farther to the west gradually deepens and broadens as it goes eastward to become Los Angeles River. This stream gathers the underground waters which come to the surface in the lower valley, with considerable surface water in times of flood, hugs the hills on the south side of the lower valley,

and leaves through a gap between the Verdugo Mountains and the eastern extension of the Santa Monica Range. It continues southward from this point through Los Angeles and finds an outlet in San Pedro Bay between San Pedro and Long Beach.

From the standpoint of agriculture, San Fernando Valley is considered well drained, with the important exception of periods when excessive volumes of water are emptied on its slopes during floods. The areas subject to cutting and filling are local. The water table usually is not high except along the Los Angeles River bottom and in small areas elsewhere. As a consequence, alkali soils are not found to any important extent. The high, stony slopes usually are excessively drained.

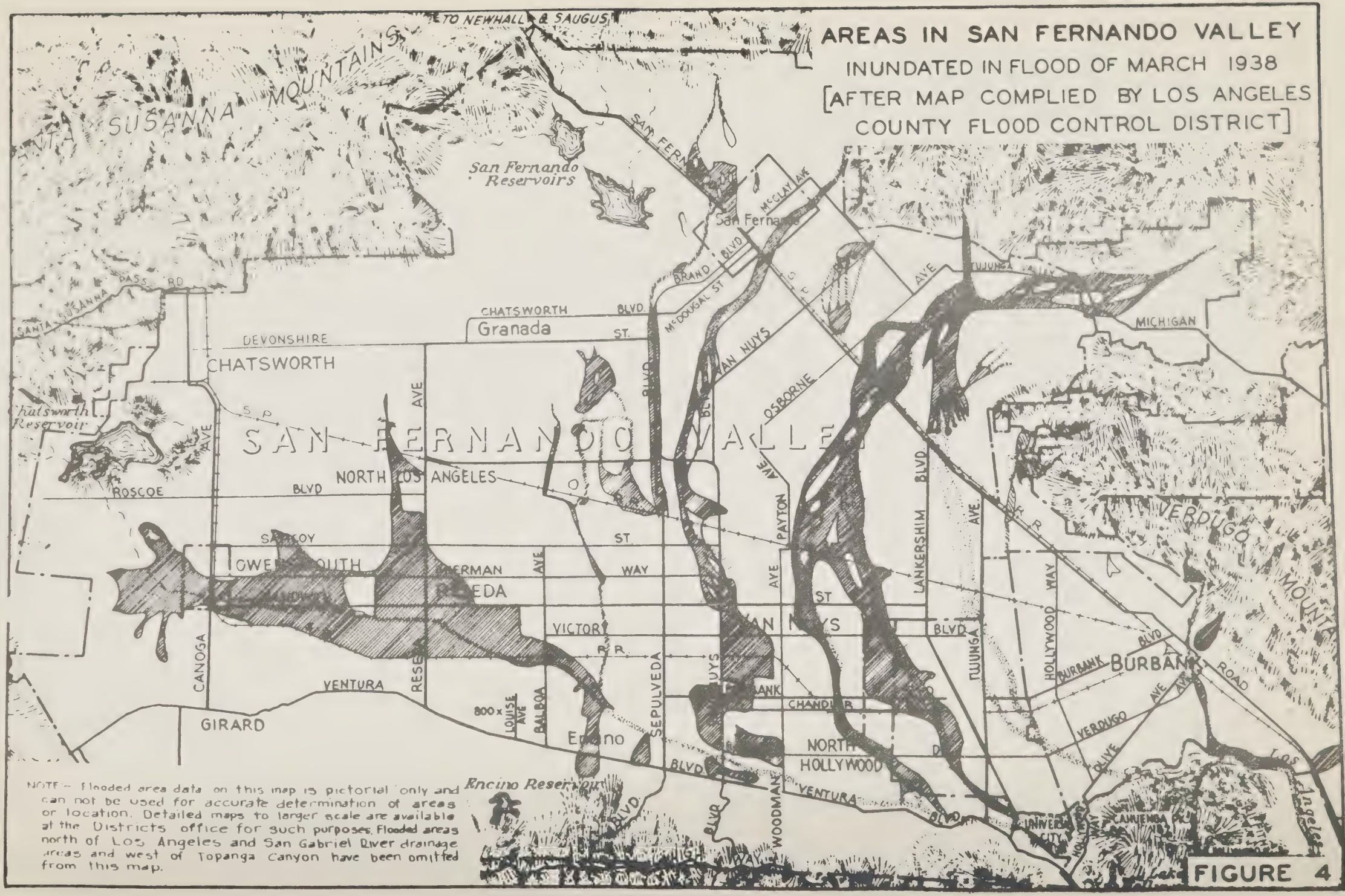
During the period since records began to be kept in southern California, regional floods destructive enough to be regarded as disasters have occurred eight times, and some of them have caused great damage in San Fernando Valley. There have been other years when floods were destructive locally but did not produce disasters. The flood of March, 1938, was the most destructive of all.

These southern California floods have owed their origin and occasional severity to the climatic and physiographic conditions of the region. Much of the effective rainfall comes in a few storms lasting three to five days during which large volumes of water fall at high rates of intensity. The mountains of the region are geologically very young and are characteristically dissected by canyons of abrupt gradients. The granitic rocks forming most of the mountains are deeply weathered and erode easily wherever the protective cover of vegetation

has been removed. The typical vegetative cover over most of the region is a dwarf forest of shrubs and small trees. This vegetation is highly susceptible to fire which, once started, is difficult to extinguish. The flood-producing sequence of fire followed by heavy rains is intensified by the long, hot rainless summers and subsequent wet seasons, with always the strong likelihood of storms of violence and volume. Cities, industries and agriculture of the region have been built upon intermontane valleys and lowlands formed in geologic times by deposition of material eroded from the surrounding mountain ranges.

Practically all floods of major proportions in this region exhibit both torrent and inundation characteristics. This was true of the 1938 flood as it affected areas in San Fernando Valley. Figure 4 pictures (without extreme accuracy) the areas inundated during that flood. Comparison of the chart with figures appearing elsewhere in this report shows that while the inundation affected many areas devoted partly to agriculture, it did not especially damage the central and western sections where the rural characteristics are the more pronounced.

Statistics compiled by the United States Engineers Office for this report show that damage done by the 1938 flood in San Fernando Valley (not including Burbank and San Fernando) totalled $12,404,527, of which $7,705,413 was direct and $4,699,114 indirect. The part of the total affecting agriculture in the valley was considerable in itself, but constituted only a small proportion of the entire loss to valley property. This agricultural total was $357,934, of which $298,278 was direct damage and $59,656 was indirect.


AREAS IN SAN FERNANDO VALLEY
INUNDATED IN FLOOD OF MARCH 1938
[AFTER MAP COMPLIED BY LOS ANGELES COUNTY FLOOD CONTROL DISTRICT]
TO NEWHALL & SAUGUS
SANTA SUSANNA MOUNTAINS
San Fernando Reservoirs
SAN FERNANDO VALLEY
CHATSWORTH
Granada
DEVONSHIRE
CHATSWORTH BLVD.
Chatsworth Reservoir
NORTH LOS ANGELES
ROSCOE BLVD
SHERMAN WAY
VICTORY BLVD
VENTURA
GIRARD
CANOGA
RESEDA
SEPULVEDA
VAN NUYS
PAYTON AVE
LANKERSHIM BLVD
TUJUNGA AVE
HOLLYWOOD WAY
BURBANK
BURBANK BLVD
VERDUGO AVE
OLIVE
MICHIGAN
OSBORNE
McCLAY AVE
BRAND BLVD
McDOUGAL ST
LOUISE AVE
BALBOA
Encino Reservoir
NORTH HOLLYWOOD
WOODMAN
UNIVERSAL CITY
CAHUENGA
NOTE — Flooded area data on this map is pictorial only and can not be used for accurate determination of areas or location. Detailed maps to larger scale are available at the Districts office for such purposes. Flooded areas north of Los Angeles and San Gabriel River drainage areas and west of Topanga Canyon have been omitted from this map.
FIGURE 4

Large-scale flood-control projects now under way on Los Angeles River and its tributaries include construction of a dam and control basin on Big Tujunga Wash which when completed should go far to remove the flood menace now existent along that channel. This (Hansen) flood control basin is now under construction. The submerged area behind the dam when water is at the spillway crest will be 790 acres, only a small part of which has been devoted to agriculture. The capacity at spillway crest will be 27,600 acre-feet. The cost of the dam and basin construction as represented by the present contract is $5,688,000, which will be increased to about $6,000,000 by incidental works not yet contracted for. The dam site is 1 mile north of San Fernando Road between San Fernando and the Foothill Boulevard. This is one of the projects of the Corps of Engineers, United States War Department, and is being financed with Federal funds except as regards rights of way which were acquired by the Los Angeles County Flood Control District at a total cost understood to be about $2,000,000.

Expected to be started in 1939 is the construction of another dam and basin on Upper Los Angeles River. This is the "Van Nuys Retention Basin" project, recommended by the Corps of Engineers. Preparation of plans for the dam is now under way, and if Congressional authorization permits, bids for construction will probably be invited in 1939. The project may cost as much as $4,000,000, not including expenditures for rights of way.

This dam site is a short distance west of Sepulveda Boulevard. According to the United States Engineers Office, the area submerged when water is at the spillway crest will be 1,180 acres, most of which has been considered agricultural acreage. However, this dam, like Hansen Dam, is not intended for storage but as a regulating device to

to prevent excessive discharges of flood waters upon areas downstream. It is unlikely that the entire land area in the reservoir site will be submerged except in times of extreme flood, and agriculture behind the dam need not be abandoned entirely provided the risks are recognized and safeguarded against.

A third project, not yet in the status of the two discussed above, but contemplated in the plans of the War Department, is a flood-control dam and basin on Pacoima Wash a short distance above San Fernando Road. This is known as the Lopez Retention Basin project.

The Tujunga, Upper Los Angeles River, and Pacoima Wash flood control basins would go far to prevent another disaster in the valley such as that of March, 1938. However, a number of other projects affecting the valley are described in the "Comprehensive Plan" of Los Angeles County Flood Control District revised as of April 18, 1938. In all, this group of projects would involve an estimated cost, including rights of way, of nearly $27,000,000. While some of the group would provide additional protection to areas adjacent to Tujunga and Pacoima Washes and Upper Los Angeles River, others would protect property affected by the minor floods on the smaller creeks and washes around the northern, western and southern fringes of the valley and such of the lands on the central floor as they have damaged occasionally. In considerable degree the dams contemplated in this latter group of projects would have the purpose of flood-debris control. The plans for these projects are not promised early consummation and farm lands which might benefit from the protection they would afford will probably have to wait several years for them.

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY

FIGURE-5-

VICINITY MAP

Indicates area covered by Base Map

LIST OF PROJECTS

LACFCD PROJECT NUMBER		LACFCD PROJECT NUMBER	
1	*Ballona Creek	25	*La Canada Area
2	*Compton Creek	29	*Los Angeles River
3	Big Tujunga	30	Los Angeles River
4	Pacoima Wash Diversion	31	Rio Hondo
5	*Sycamore Wash	32	*Alhambra Wash
6	*Verdugo Wash	35	Los Angeles River, Cerritos Trestle
8	*Haines Canyon	37	Big Dalton Wash
9	*Eaton Wash	38	*Little Dalton Wash
11	Burbank Wash	40	San Jose Creek
13	Central Los Angeles River	40A	San Jose Creek
14A	*Los Angeles River	46	*Haines Canyon, 2nd Unit
14B	*Los Angeles River	49	Burbank Western System
15	*Upper Los Angeles River	56	*Los Angeles River
18	Lower San Gabriel River	67	*Long Beach-Northeast
18A	Central San Gabriel River	69	*Arroyo de Los Jardines
18B	San Gabriel River Outlet	70	*Kenter Canyon
19	*Rubio Wash	71	San Gabriel River & Rio Hondo
20	*Alhambra Wash	–	Lopez Flood Control Basin
22	*La Crescenta	–	Upper Los Angeles River Flood Control Basin
24	Burbank Eastern System	–	Hansen Flood Control Basin
36	Altadena Area (Rubio Diversion)	–	Verdugo Debris Basin
		–	Santa Fe Flood Control Basin
		–	Whittier Narrows Flood Control Basin

5 & 6 were combined as one project in original 14 approved U.S.E.D. projects
14A & 14B were combined as one project in original 14 approved U.S.E.D. projects
20 & 32 were combined as one project in original 14 approved U.S.E.D. projects
8, 22, 25 & 46 were combined as one project in original 14 approved U.S.E.D. projects
15 & 56 were combined as one project in original 14 approved U.S.E.D. projects

Note Projects indicated by (*) were wholely or partly included in original 14 approved U.S.E.D. projects

LEGEND

- Indicates Channels
- Indicates Debris Basins
- Indicates Flood Control Basins
- 56 Indicates L.A.C.F.C.D. Project Numbers

USED GENERAL PLAN FOR FLOOD CONTROL LOS ANGELES & SAN GABRIEL RIVERS

SCALE OF MILES

U.S. ENGINEER OFFICE, LOS ANGELES, CALIF. DEC 1938

SUBMITTED BY C.E. Crouch APPROVED BY Thomas M. Robbins

DRAWN TRACED CHECKED TO ACCOMPANY REPORT DATED DECEMBER 15, 1938

Figure 5 shows an outline of the various projects affecting San Fernando Valley included in the "U.S.E.D. General Plan" of flood control works in Los Angeles County.

Transportation

One of the trunk lines of the Southern Pacific Railroad enters the lower southeastern part of the valley. At Burbank this separates into three branches. The San Joaquin Valley line continues northwestward along the upper valley slopes through the city of San Fernando and leaves San Fernando Valley at the north. The Coast line runs more nearly westward across the center of the valley through North Los Angeles and Chatsworth. The third line extends along the southern part to Canoga Park and thence northward to Chatsworth. The Pacific Electric Railway enters the valley from the southeast through Cahuenga Pass and extends through North Hollywood to Van Nuys (i.e., North Sherman Way). This line provides both passenger and freight service. From Van Nuys two freight lines are operated, one extending northward to San Fernando, the other westward to Canoga Park. These steam and electric railroads are supplemented by passenger-bus and truck services which afford transportation in the valley and from it to down-town Los Angeles and more distant centers.

Routes of the valley electric-car and bus services are described below:

By Pacific Electric Company:

LOS ANGELES-VAN NUYS RAIL SERVICE:
Connection at Universal City with Ventura Boulevard Motor Coach Line and North Hollywood Motor Coach Line.
Connection at Van Nuys with Van Nuys-Canoga Park-San Fernando Motor Coach Line.

VAN NUYS-CANOGA PARK MOTOR COACH ROUTE:
From Van Nuys (Calvert Street), north on Van Nuys Blvd. and west on Sherman Way to Canoga Park (Topanga Canyon Blvd.)

VAN NUYS-SAN FERNANDO MOTOR COACH ROUTE:
From Van Nuys (Calvert Street), north on Van Nuys Blvd., west on Parthenia St., northwest on Gamut Place, north and east on Sepulveda Blvd. and Brand Blvd. to San Fernando.

VENTURA BOULEVARD MOTOR COACH ROUTE:
From Universal City, west on Ventura Blvd. to Reseda Blvd.

NORTH HOLLYWOOD MOTOR COACH ROUTE:
From Universal City, north on Lankershim Blvd., west on Victory Blvd., and north on Whitsett Ave. to Vanowen St. Return, from Whitsett Ave. and Vanowen St., east on Vanowen St. and south on Lankershim Blvd. to Universal City.

By Original Stage Line, Inc.:

Los Angeles to San Fernando, via Glendale, Burbank and Roscoe.

The primary purpose of the car and bus services outlined above appears to be to provide transportation between valley and down-town points, rather than between valley stations themselves.

Several excellent boulevards extend the entire length of the area. These thoroughfares, together with the large number of cross-roads, make all valley sections accessible to the business center of Los Angeles and other metropolitan areas. All but a few of these public roads are paved. While the original construction of many of them was financed by local improvement districts, they are now maintained as city streets. Such of the roads as are included in the State Highway System (and there are several) receive the benefits of gasoline-tax collections. The two main-traveled thoroughfares are San Fernando Road and Ventura Boulevard,

which are, respectively, parts of Federal Highways 99 and 101. These, unlike the railroad lines, do not converge near Burbank, although Highway 99 passes through that city. Route 101 leaves the valley via Cahuenga Pass and proceeds southward to Central Los Angeles through Hollywood.

While this avoidance of a direct junction eases what might otherwise be a serious traffic complication, the direction of highway travel from the valley into the main business section of the city, by following the closely neighboring natural outlets, actually represents a funnel similar to that through which the natural drainage of the valley discharges. However, rights of way already acquired will permit the substantial widening of the Cahuenga Pass route into down-town Los Angeles, and the Laurel Canyon and Sepulveda Boulevard routes, which now provide short-cut outlets across the mountains into the western portion of the city proper, could take care of a considerable increase of highway traffic.

A convenient and scenic outlet to Malibu and other beaches is the Topanga Canyon Road, which had its part in shaping recent population movements in the valley, notably the establishment there of homes of many moving-picture actors. The valley cross-road contributing most importantly to the traffic of both main routes is Lankershim Boulevard. Sepulveda Boulevard, Van Nuys Boulevard and Laurel Canyon Boulevard make like contributions. A highway traffic survey [1/] made in 1937 by the Regional Planning Commission of Los Angeles County produced a series

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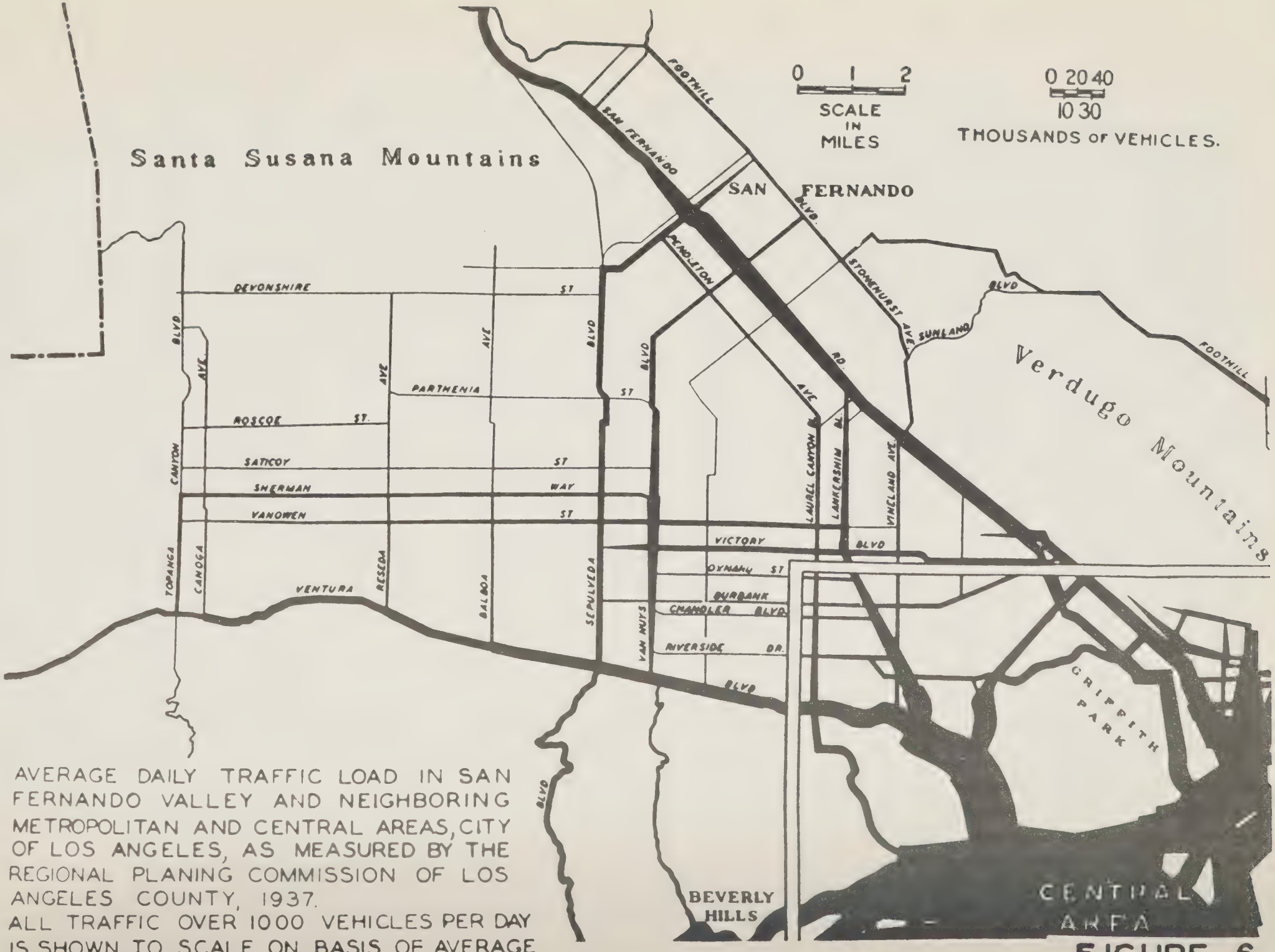
1/ Report of a Highway Traffic Survey in the County of Los Angeles. The Regional Planning Commission, 1937.



AVERAGE DAILY TRAFFIC LOAD IN SAN FERNANDO VALLEY AND NEIGHBORING METROPOLITAN AND CENTRAL AREAS, CITY OF LOS ANGELES, AS MEASURED BY THE REGIONAL PLANING COMMISSION OF LOS ANGELES COUNTY, 1937.
ALL TRAFFIC OVER 1000 VEHICLES PER DAY IS SHOWN TO SCALE ON BASIS OF AVERAGE 24 HOUR DAY.

FIGURE 6

of volume-of-traffic maps from one of which Figure 6 was detached to depict the volume of traffic on the main valley roads and streets and on the major thoroughfares descending into the heart of the city.

Table 3 shows statistically the information on which Figure 6 was based.

The report of the 1937 traffic survey shows also normal driving time, at 5-minute intervals, from the Civic Center to valley zones. Less than one hour (i.e., 55 minutes) is shown to be needed to reach the western boundaries of the valley from the Civic Center, while the driving time to the foothills north of San Fernando is indicated as about 45 minutes.

These driving times are shorter than those needed by the electric car and bus services.

Population Status and Trends

The volume-of-traffic map (Fig. 6) suggests with approximate correctness the distribution of population throughout the valley. No definite segregation of Federal Census or like enumeration statistics is available to show the distribution with exactness, except a breakdown of the April 1, 1930 figures made by the Research Department of the Los Angeles Chamber of Commerce in cooperation with the Bureau of the Census. This examination indicated a population for Statistical Area 1, as delineated on Figure 7, of 51,636. This total (which did not include Burbank and San Fernando) was distributed among the tracts comprising Figure 7, as shown in Table 4.

Table 3. -- Traffic volume on most-traveled routes in San Fernando Valley.

Street Name	From	To	Class of Highway	Linear Feet	24-hour Traffic Volume	Vehicle Miles Per Day
San Fernando Rd.	Los Angeles City Limits	Foothill Blvd.	SR 4 US 99	1,700	5,000	1,610
"	Foothill Blvd.	Sepulveda Blvd.	"	6,340	7,000	8,405
"	Sepulveda Blvd.	San Fernando City Limits	"	16,060	10,000	30,417
"	San Fernando City Lim.	Brand Blvd.	"	4,400	14,500	12,083
"	Brand Blvd.	Los Angeles City Limits	"	1,500	14,500	4,119
"	Los Angeles City Limits	Van Nuys Blvd.	"	6,570	14,000	17,420
"	Van Nuys Blvd.	Lankershim Blvd.	"	15,640	11,500	34,064
"	Lankershim Blvd.	Vineland Ave.	"	7,250	8,500	11,671
"	Vineland Ave.	Burbank City Limits	"	7,580	11,700	16,797
"	Burbank City Limits	Empire Ave.	"	8,400	11,700	18,614
"	Empire Ave.	Burbank Blvd.	"	4,600	8,000	6,970
"	Burbank Blvd.	Olive Ave.	"	2,900	8,000	4,394
"	Olive Ave.	Glendale City Limits	"	3,920	8,500	6,311
"	Glendale City Limits	Sonora Ave.	"	4,230	9,300	7,451
"	Sonora Ave.	Milford St.	"	6,300	11,500	13,722
"	Milford St.	Broadway	"	2,120	16,000	6,424
"	Broadway	Colorado St.	"	1,660	20,000	6,288
"	Colorado St.	Los Feliz Blvd.	"	6,340	16,500	19,812
"	Los Feliz Blvd.	Central Ave.	"	700	18,000	2,386
"	Central Ave.	Glendale Ave.	"	1,850	16,000	5,606
"	Glendale Ave.	Glendale City Limits	"	1,100	23,000	4,792
"	Glendale City Limits	Fletcher Dr.	"	2,720	23,000	11,849
"	Fletcher Dr.	Marguerite St.	"	720	24,000	3,273
"	Marguerite St.	Verdugo Rd.	"	3,740	18,700	13,246
"	Verdugo Rd.	Ave. 26	"	7,560	24,000	34,364
"	Ave. 26	Figueroa St.	"	1,950	17,000	6,278
"	Figueroa St.	Pasadena Ave.	"	2,910	16,500	9,094
Lankershim Blvd.	San Fernando Road	Van Owen St.	SR 159	14,300	3,800	10,292
"	Van Owen St.	Victory Blvd.	"	2,640	5,800	2,900
"	Victory Blvd.	Oxnard St.	"	2,950	5,500	3,073
"	Oxnard St.	Burbank Blvd.	"	2,930	6,500	3,607

Table 3. -- (Continued)

Street Name	From	To	Class of Highway	Linear Feet	24-hour Traffic Volume	Vehicle Miles Per Day
Lankershim Blvd.	Burbank Blvd.	Magnolia Ave.	SR 159	2,880	7,500	4,091
"	Magnolia Ave.	Riverside Dr.	"	5,100	9,000	7,693
"	Riverside Dr.	Valley Spring Lane	"	2,220	11,500	4,835
"	Valley Spring Lane	Ventura Blvd.	"	3,800	14,000	10,076
Ventura Blvd.	County Line	Los Angeles City Limits	SR 2 US 101	55,950	3,500	37,088
"	Los Angeles City Limits	Canoga Ave.	"	13,570	3,500	8,995
"	Canoga Ave.	Reseda Ave.	"	19,240	5,500	20,042
"	Reseda Ave.	Balboa Ave.	"	11,050	6,000	12,557
"	Balboa Ave.	Woodman Ave.	"	21,420	8,000	32,455
"	Woodman Ave.	Laurel Canyon Blvd.	"	11,200	9,500	20,152
"	Laurel Canyon Blvd.	100'E. of Colfax Ave.	"	2,600	11,500	5,663
"	100'E. of Colfax Ave.	150'E. of Vineland Ave.	"	5,830	14,000	15,458
"	150'E. of Vineland Ave.	Lankershim Blvd.	"	2,260	15,000	6,420
Laurel Canyon Bl.	Brand Blvd.	Victory Blvd.	Major	37,770	2,300	16,453
"	Victory Blvd.	Burbank Blvd.	"	5,220	2,000	1,977
"	Burbank Blvd.	Chandler Blvd.	"	1,300	3,000	739
"	Chandler Blvd.	Riverside Dr.	"	3,900	3,500	2,585
"	Riverside Dr.	Ventura Blvd.	"	5,130	4,300	4,178
"	Ventura Blvd.	Hollywood Blvd.	"	11,200	5,000	10,606
"	Hollywood Blvd.	Sunset Blvd.	"	1,400	5,500	1,458
Van Nuys Blvd.	Ventura Blvd.	Valleyheart Dr.	"	2,570	2,800	1,363
"	Valleyheart Dr.	Burbank Blvd.	"	5,020	4,000	3,805
"	Burbank Blvd.	Victory Blvd.	"	5,200	6,000	5,909
"	Victory Blvd.	Van Owen St.	"	2,600	7,500	3,693
"	Van Owen St.	Sherman Way	"	2,600	9,300	4,580
"	Sherman Way	Saticoy St.	"	2,600	6,300	3,102
"	Saticoy St.	Parthenia St.	"	6,700	5,000	6,345
"	Parthenia St.	Laurel Canyon Blvd.	"	13,950	3,400	8,983
"	Laurel Canyon Blvd.	Foothill Blvd.	"	12,100	2,500	5,729
Sepulveda Blvd.	Stranwood Ave.	Ventura Blvd.	SR 158	41,700	4,500	35,540
"	Ventura Blvd.	Sunset Blvd.	"	13,450	4,000	10,189
"	Sunset Blvd.	Los Angeles City Limits	"	5,590	4,500	4,764
"	Los Angeles City Limits	Wilshire Blvd.	"	1,850	4,500	1,577

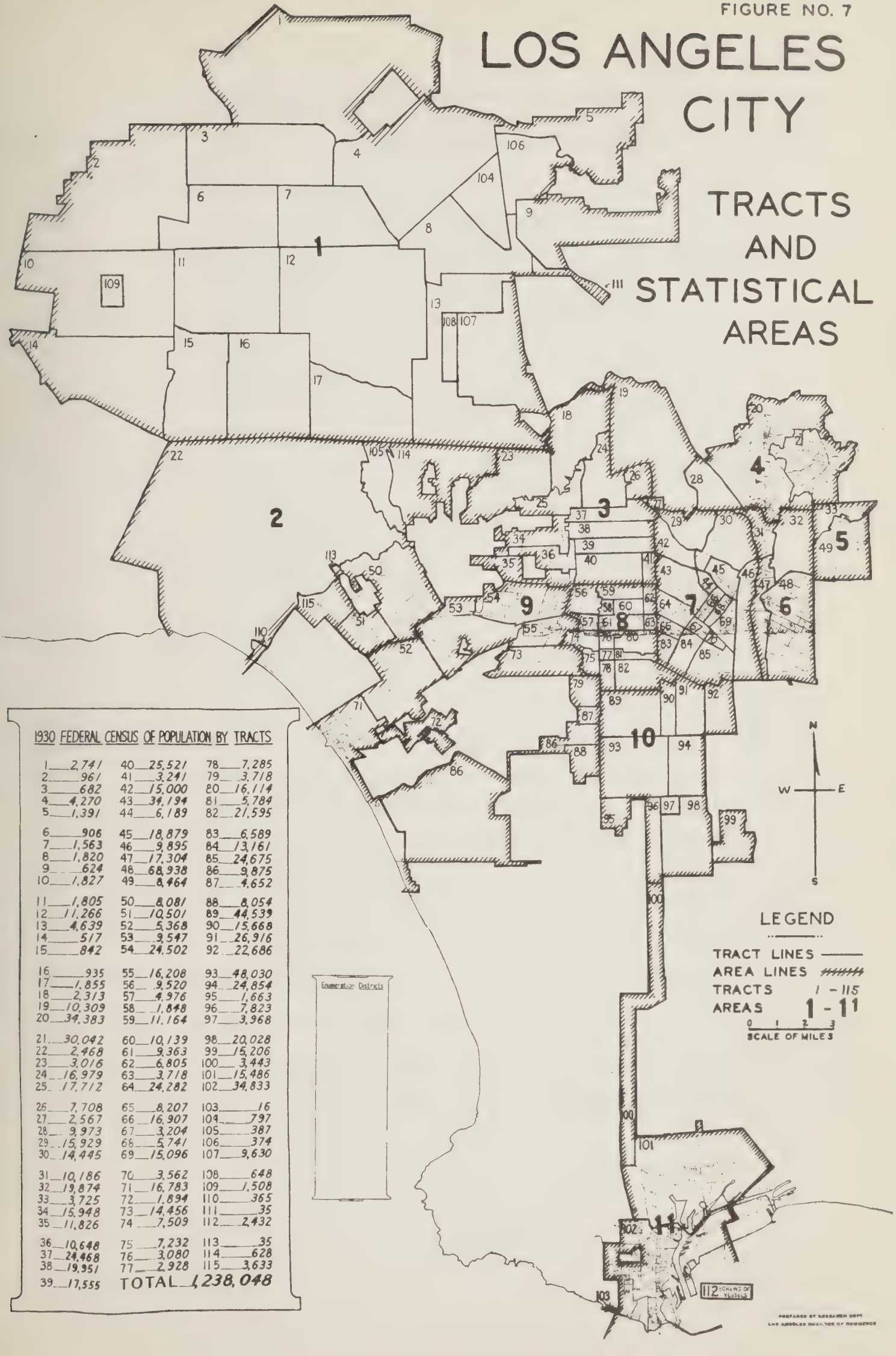
Table 3. -- (Continued)

Street Name	From	To	Class of Highway	Linear Feet	24-hour Traffic Volume	Vehicle Miles Per Day
Sepulveda Blvd.	Wilshire Blvd.	Los Angeles City Limits	SR 158	2,470	7,500	3,509
"	Los Angeles City Limits	Santa Monica Blvd.	"	1,280	7,500	818
"	Santa Monica Blvd.	Pico Blvd.	"	6,540	6,000	7,432
"	Pico Blvd.	Venice Blvd.	"	10,370	3,700	7,267
"	Venice Blvd.	Washington Blvd.	"	2,400	2,800	1,273
"	Washington Blvd.	Culver Blvd.	"	1,320	1,500	375
"	La Tijera Blvd.	Lincoln Blvd.	"	6,640	5,000	6,288
"	Lincoln Blvd.	Imperial Hwy.	SR 60 US101A	2,300	7,000	3,049
"	Rosecrans Ave.	Hermosa Bch. Cy. Lim.	"	9,200	9,000	15,682
"	Hermosa Bch. Cy. Lim.	Gould Lane	"	1,430	10,000	2,708
"	Long Beach City Limits	Los Angeles City Limits	Major	160	5,300	161
"	Los Angeles City Limits	" " " "	"	580	5,300	582
"	" " " "	Alameda St.	"	3,350	5,300	3,363
"	Alameda St.	Wilmington Ave.	"	6,200	8,000	9,394
"	Wilmington Ave.	Avalon Blvd.	"	2,690	6,800	3,464
"	Avalon Blvd.	Main St.	"	3,470	5,500	3,615

FIGURE NO. 7

LOS ANGELES CITY

TRACTS AND STATISTICAL AREAS



1930 FEDERAL CENSUS OF POPULATION BY TRACTS

1 2,741	40 25,521	78 7,285
2 961	41 3,241	79 3,718
3 682	42 15,000	80 16,114
4 4,270	43 34,194	81 5,784
5 1,391	44 6,189	82 21,595
6 906	45 18,879	83 6,589
7 1,563	46 9,895	84 13,161
8 1,820	47 17,304	85 24,675
9 624	48 68,938	86 9,875
10 1,827	49 8,464	87 4,652
11 1,805	50 8,081	88 8,054
12 11,266	51 10,501	89 44,539
13 4,639	52 5,368	90 15,668
14 517	53 9,547	91 26,916
15 842	54 24,502	92 22,686
16 935	55 16,208	93 48,030
17 1,855	56 9,520	94 24,854
18 2,313	57 4,976	95 1,663
19 10,309	58 1,848	96 7,823
20 34,383	59 11,164	97 3,968
21 30,042	60 10,139	98 20,028
22 2,468	61 9,363	99 15,206
23 3,016	62 6,805	100 3,443
24 16,979	63 3,718	101 15,486
25 17,712	64 24,282	102 34,833
26 7,708	65 8,207	103 16
27 2,567	66 16,907	104 797
28 9,973	67 3,204	105 387
29 15,929	68 5,741	106 374
30 14,445	69 15,096	107 9,630
31 10,186	70 3,562	108 648
32 19,874	71 16,783	109 1,508
33 3,725	72 1,894	110 365
34 15,948	73 14,456	111 35
35 11,826	74 7,509	112 2,432
36 10,648	75 7,232	113 35
37 24,468	76 3,080	114 628
38 19,951	77 2,928	115 3,633
39 17,555	TOTAL 1,238,048	

Table 4. -- Population of San Fernando Valley, by tracts, April 1, 1930. (From results of the Fifteenth Decennial Census of the United States)

Tract Number	Tract Name	Population
1	Sylmar	2,741
2	Chatsworth	961
3	Granada	682
4	Pacoima	4,270
5	Sunland	1,391
6	North Los Angeles	906
7	Sepulveda	1,563
8	Roscoe No. 1	1,820
9	Tuna Canyon	624
10	Owensmouth No. 2	1,827
11	Reseda	1,805
12	Van Nuys	11,266
13	No. Hollywood No. 3	4,639
14	Girard	517
15	Tarzana	842
16	Encino	935
17	Cahuenga	1,855
104	Hansen Heights No. 2	797
106	Hansen Heights No. 1	374
111	Roscoe No. 2	35
107	No. Hollywood No. 1	9,630
108	No. Hollywood No. 2	648
109	Owensmouth No. 1	1,508
Total, Los Angeles portion of Valley		51,636

While no complete enumeration of population has been made since 1930, a reasonably accurate measurement of the development since then is possible if the assumption is made that it has retained the general characteristics of 1930. The scale by which this measurement is made is the 1930 ratio of number of persons (April 1) to the number of domestic water meters in use (June 30). This was closely 3.5 to 1.

If this ratio has held throughout the period since 1930, the growth of population in the valley (excluding Burbank and San Fernando) has been as shown in Table 5.

Table 5. -- Estimated growth of population in San Fernando Valley since 1930, based on ratio then existing of 3.5 persons to 1 domestic water meter.

Year	Domestic water meters (1 inch and smaller)		Population 1/	
	Number	Increase since preceding year	Number	Increase since preceding year
1930	14,717	---	51,636	---
1931	15,166	349	52,857	1,221
1932	15,400	234	53,686	829
1933	15,844	444	55,240	1,554
1934	16,183	339	56,426	1,186
1935	17,013	830	59,331	2,905
1936	18,888	1,875	65,993	6,662
1937	21,662	2,774	75,702	9,709
1938	23,985	2,323	83,832	8,130

1/ Not including Burbank and San Fernando.

The significant indication of Table 5 is that while the population of San Fernando Valley has shown a generally accelerating tendency since 1930, the increase has been more than 40 percent since 1935 and more than one-fourth since 1936. While the actual increase between 1937 and 1938 was slightly less than during the preceding year it was almost one-sixth of the total population of 1930.

On the basis of the 1930 distribution shown by Table 4 (see also Figure 7), nearly 55 percent of the total population was in the south-

eastern corner of the valley, where Tracts 12, 13, 17, 107 and 108 constitute only about one-fifth the total area. It is probable that the number living east of Sepulveda Boulevard (and Brand Boulevard into San Fernando City) was more than three-fourths the total.

No definite basis is available by which to localize the present distribution of population with exactness, but Figure 8, prepared in 1937 by the Engineering Department of the Automobile Club of Southern California from the 1936 register of voters, serves to do this in a general way for that recent year. However, growth of population since 1936 has been rapid, and while undoubtedly it has been most marked in the southeastern corner of the valley, it has not been confined entirely to that section. Several active subdivision projects are in progress in portions of the more strictly agricultural areas which, if successful, will substantially increase the number of persons now living thereabouts.

Where the recently accomplished growth is most evident (i.e., in the sections converging toward the southeastern traffic outlets) probably a material portion of it has taken place in subdivisions planned and partly opened in the boom era of about 10 years ago. The ensuing depression cut short many of these developments after much preliminary work on streets, sidewalks, and other general improvements had been done. Such areas lay more or less idle since then until the recent revival of interest in the residential advantages of the valley. Hence, despite the undeniable impetus of the movement now in progress and its spread to areas west of the section now most populous, it has not as yet cut

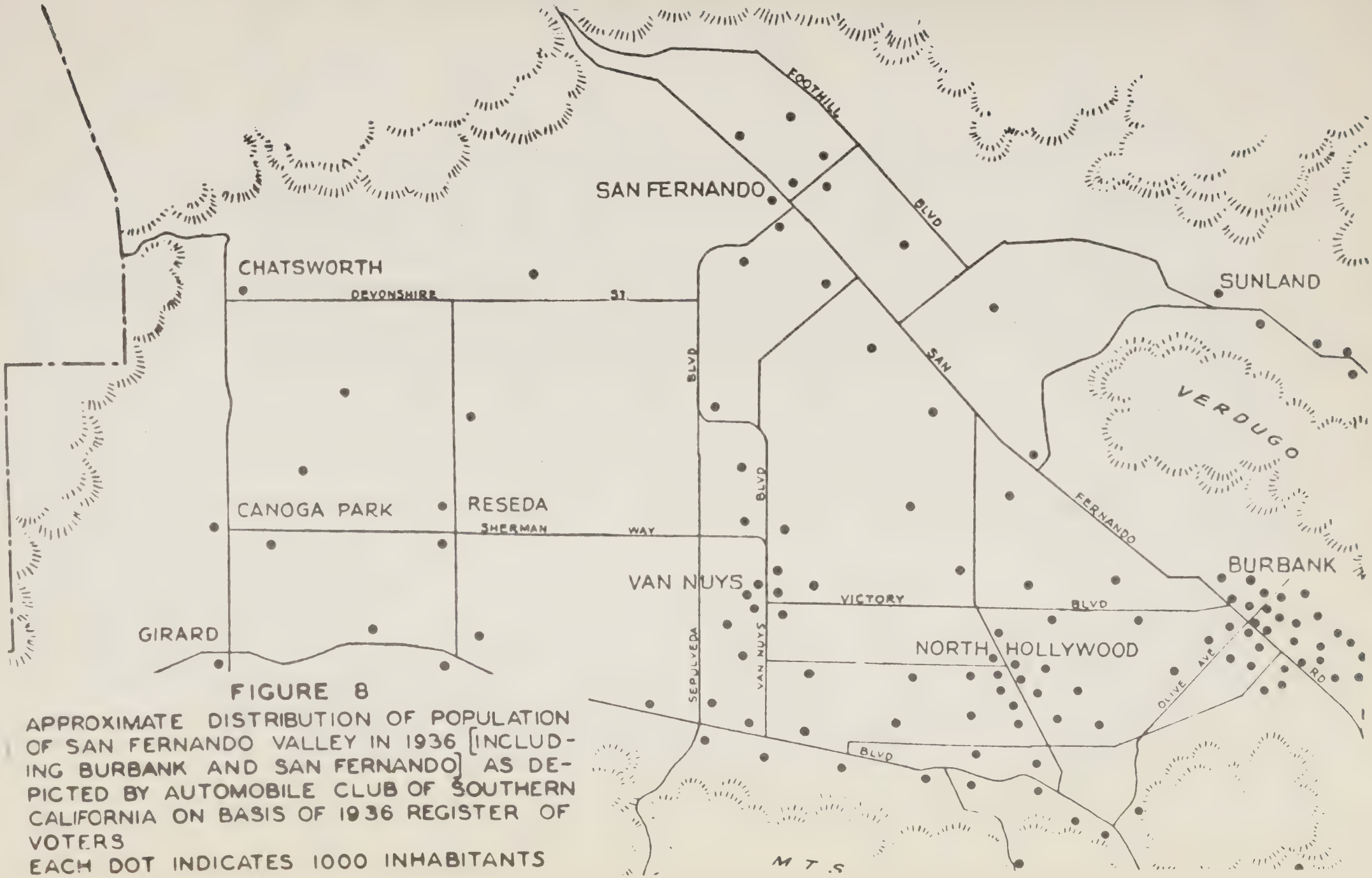


FIGURE 8

APPROXIMATE DISTRIBUTION OF POPULATION OF SAN FERNANDO VALLEY IN 1936 [INCLUDING BURBANK AND SAN FERNANDO] AS DEPICTED BY AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA ON BASIS OF 1936 REGISTER OF VOTERS

EACH DOT INDICATES 1000 INHABITANTS

seriously into the total acreage devoted to agriculture. This fact appears in the agricultural statistics shown at later places in this report. Here the statement is supported by citation of the fact that while the number of domestic water meters has increased rapidly in recent years (see Table 4), the number of irrigation meters was at its peak (3,611) June 30, 1937 and was only slightly lower June 30, 1938 (3,593).

Industry

Population growth described in preceding paragraphs has not been accompanied by an advent of factories. Such of the latter as are in marked evidence are of the type to be expected in a community still largely supported by agriculture (i.e., packing houses, etc.). However, there has been a substantial increase in number of stores, more or less universally keeping step with the growth of population. This is disclosed by Table 6, which shows the progress of retail distribution of merchandise, as indicated by the number of stores in the several principal communities in the valley in 1929, 1933 and 1935. Table 6 was abstracted from the more elaborate tabulations resulting from a cooperative study made recently by the Research Department of the Los Angeles Chamber of Commerce and the Federal Bureau of the Census.

Significant in the growth shown by Table 6 is the fact that it was marked especially in the cases of food, restaurant and service station units, and not so marked in the cases of clothing, furniture and similar store units.

Table 6. -- Progress of retail distribution of merchandise in San Fernando Valley, as indicated by number of stores in the several communities in 1929, 1933 and 1935.

Year	San Fernando	Canoga Park-Chatsworth	Van Nuys	North Hollywood	Sunland-Tujunga	Total Valley
	Number	Number	Number	Number	Number	Number
1929	181	57	197	192	53	680
1933	228	85	258	282	87	940
1935	287	85	330	368	93	1,163

A type of development which elsewhere has been considerably disruptive of agriculture and other normal industries has some possibilities in the northwestern sections of the valley. This is represented by recent oil-drilling activities on the lands of the B. F. Porter estate, where the Standard Oil Company has a producing well and other wells are being drilled. However, while it is understood that the oil structure has not been explored by drilling to an extent sufficient to outline the structure and indicate its producing possibilities, the impression of employees in the Los Angeles office of the State Division of Oil and Gas appears to be that the oil structure is probably of small extent and may not extend into the valley proper. Hence it now seems likely that this recent activity will have little, if any, bearing on the agricultural future of the valley.

No strong urge is evident to effect the entry of large industrial factory units into the valley. Transportation limitations, restricted sewerage facilities, and objections reasonably to be expected against odors and noise in a community distinctly unwilling to surrender its residential advantages, are likely to operate against any abrupt wide-scale industrialization of the area.

PUBLIC SERVICES AND UTILITIES

The farmers of San Fernando Valley have access to numerous advantages besides those already noted, which are not frequently within reach of agricultural areas. For instance, a domestic water supply of excellent quality, under pressure, is available from the city mains and telephone communication throughout the area is handled by the metropolitan exchanges. The extent to which it is benefited in other respects by public service and utility agencies is outlined in the following paragraphs:

School Facilities:

Los Angeles City School District maintains eight high schools and 35 elementary schools in San Fernando Valley. As divided between "Upper Valley" and "Lower Valley", and with comparative enrollments for the present year and that of 5 years ago they are shown in Table 7. During the period, the enrollment in the Upper Valley elementary schools increased from 4,842 to 5,480, and the high-school enrollment increased from 2,381 to 3,173. The corresponding increases for the Lower Valley were: elementary schools, 5,545 to 6,807; high schools, 3,059 to 5,352. The increase in all enrollments for the entire valley was from 15,827 to 20,812.

In addition to the elementary and high-school facilities listed in Table 7, an evening high school is maintained in the Van Nuys building.

Table 7. -- Enrollment in Public Schools of San Fernando Valley, Calif., 1933-4 and 1938-9.

School	Upper Valley		Lower Valley	
	1933-4	1938-9	1933-4	1938-9
Elementary				
Canoga Park	388	523		
Carpenter Avenue			125	321
Chatsworth Park	176	213		
Encino	82	88		
Eton Avenue	271	229		
Haddon Street			163	238
Hansen Heights			89	97
Hayvenhurst Avenue	219	352		
Hazeltine Avenue			113	182
Lankershim			1084	1101
Lemona Avenue	208	184		
McKinley Home			215	159
Morningside	644	699		
O'Melveny	423	449		
Pacoima			413	576
Pinewood Avenue			519	412
Plainview Avenue (Branch of Pinewood Ave. from 1933 to 1936)				248
Remsen Street			75	72
Reseda	285	408		
Rio Vista			377	623
Riverside Drive (new 1938)				241
Roscoe			454	564
San Fernando	767	739		
Satiooy Street			114	133
Sepulveda	274	309		
Sherman Oaks	348	461		
Sunland			220	217
Tarzana	224	233		
Valley View			79	74
Van Nuys			929	906
Victory Boulevard			510	522
Vinedale			66	121
Winnetka Avenue	168	331		
Zelzah	181	166		
Olive View (Tuberculous)	184	96		
High				
Canoga Park	537	794		
El Retiro	57	69		
North Hollywood			1616	2537
Pacific Lodge	46	90		
San Fernando	1670	2091		
Van Nuys			1443	2181
Verdugo Hills (new 1938)				634
Olive View (Tuberculous)	71	129		
TOTAL	7223	8653	8604	12159

The single junior college in the Los Angeles city system is not in San Fernando Valley. Some interest has lately been manifested in the idea that establishment of such a college with purposes and equipment similar to the branch college at Davis, Calif., might contribute valuably to solution of the agricultural problems of the valley through supervision of and coordination with the University of California (at Los Angeles). While having local support, this plan has not taken definite form, and apparently has no early likelihood of development. Operating against it are the uncertainties regarding the possible effect upon the present agriculture of the valley of a continued influx of urban population, and the fact that the full benefits of State and Federal governmental services have not yet been obtained.

During the current year, the following courses in agriculture are being taught in the indicated Valley high schools, with the enrollments shown:

Agriculture B7 and A8. San Fernando School has 3 classes, 67 pupils. Course B7 teaches practical acquaintance with the names, uses, care, and propagation of the more common plants. Experiments and reports on special assignments dealing with plants and animals. 1 quarter, 5 periods per week. Course A8 teaches development of skill and knowledge essential to growing home vegetable gardens and flowers, and to caring for lawns, shrubs, and poultry. 1 quarter. 5 periods per week.

Agriculture 1 and 2 (B9-A12). Pacific Lodge School has 2 classes, 30 pupils. These courses teach methods of growing gardens, shrubs, and trees; plant propagation, fertilization, and pruning; care of animals; harmful insects and pests.

Animal Husbandry 3 (B10-A12). Van Nuys School has 1 class, 26 pupils. This course is a study of modern dairy methods and products; scoring of products -- milk, cream, butter, cheese, and ice cream; pasteurizing, bottling, and deliverying; cheese, butter, and ice cream making.

Landscape and Design 1 and 2 (B10-A12). Van Nuys School has 5 classes, 142 pupils. North Hollywood School has 1 class, 26 pupils. This course teaches how to arrange lawns, shrubs, trees, and buildings into landscape pictures; types of gardens; formal and informal design; care of grounds.

Vocational Agriculture 1, 2, 3 and 4 (B10-A12). Smith-Hughes Agriculture - State Plan. Canoga Park School has 3 classes, 78 pupils. Van Nuys School has 3 classes, 78 pupils. These courses teach modern methods and practices in agriculture; development of knowledge and skill in pupils contemplating agriculture as a vocation.

Forestry and Conservation (B9-A12). San Fernando School has 2 classes, 42 pupils. This course teaches fire prevention, reforestation, trail building, soil erosion, study of native vegetation, nursery practice; seed collecting, transplanting, pest control.

In addition to the high-school courses now being taught, other courses in various phases of agriculture are authorized for inclusion in the programs of junior and senior high schools of the city system. Authorization means that any school is free, except in a few instances, to include the course in its program. It does not mean, however, that the schools are required to offer all the authorized courses, selection being based on consideration of the needs of the pupils and those of the local community as well as the instructional resources of the individual school.

In seventh and eighth grade elementary schools special teachers also instruct in agriculture. In many sixth grade schools the significance of agriculture is taught in an elementary way in connection with units of work.

Fire Protection:

No part of the valley is without a fair degree of fire protection. Seven fire companies are stationed as follows:

14407 Slyvan St., Van Nuys
11222 Weddington St., North Hollywood
7248 Owensmouth Ave., Canoga Park
7414 Reseda Blvd., Reseda
7157 Valmont St., Tujunga
11242 Laurel Canyon Blvd. near San Fernando
Coldwater Canyon & Mulholland Drive (above North Hollywood)

On account of the wide expanse of the valley and the desire of many residents to have some fire protection facilities nearer than the closest regular company, a number of volunteer companies has been established. Most of these companies are directed by foremen provided and partly paid by the Department. A Ford or Chevrolet with hose and hose reel is provided by the city in all cases.

These volunteer companies have been of good service at times, sometimes controlling a fire, sometimes holding it in check until the arrival of the regular company. They are located as follows: Brants Ranch, Chatsworth, Encino, Fernangeles, Girard, Granada, McKinley Home, Northridge, Pacoima, Roscoe, Sepulveda, Sherman Oaks, Studio City, Tarzana, Week's Colony, Hansen Heights, Harvard Military School, Lakeside Park, Runnymede, Saticoy School, Sunshine Ranch. San Fernando City has its own fire department, and unless request is made for aid the Los Angeles Fire Department does not respond to fires in that area.

Police Protection:

Divisional police headquarters are at Van Nuys, which is approximately the geographic center of the 206 square miles comprising Valley Division. The personnel assigned to the division, including eight motorcycle officers, eight detectives and seven civilian employees, numbers 93.

The Division has three sub-stations: North Hollywood, Canoga Park, and Tujunga. Owing to its isolation from the valley proper, the Tujunga station is manned by three officers, one on each watch, who patrol the Sunland-Tujunga area by radio car and spend alternate hours in their office. The other two stations are manned by resident officers who live in the building housing the office and do no patrol work. They are available for information or emergencies near at hand, 24 hours a day.

All districts, including the Sunland-Tujunga area, have what is known as "foreign telephone service", which eliminates the toll charge on calls for the police from any point. Such calls come direct to headquarters at Van Nuys.

In the business districts of the communities of Van Nuys and North Hollywood, a foot patrol is maintained twenty-four hours a day. All other districts are served by the radio cars exclusively.

The entire division is laid out into radio car districts so that every portion of it is subject to patrol by one or more of the cars day and night. However, since most of the calls come from the more thickly populated districts, those districts are patrolled more thoroughly than the outlying and sparsely-populated areas. A service well regarded in the more strictly farming sections is the agricultural-theft patrol, which has established a high reputation for controlling this type of criminal activity.

There are now five radio cars assigned to the night watch and four each to the morning and day watches. In each instance one car is manned by a sergeant whose principal duty is to supervise the work of the radio car crews, though he is subject to call at any time.

Divisional headquarters at Van Nuys is connected with Central headquarters by two leased telephone wires and by both sending and receiving teletype units. Phone calls coming into divisional headquarters, requiring the service of radio cars, are segregated as to importance by the desk sergeant and are transmitted by phone to the central complaint board, to be put on the air immediately, if important, or given directly to radio cars at their hourly reporting intervals if not of great importance.

The allocation of personnel and equipment to this division, as in all others of the city, is determined principally by the following factors: area to be covered; number of inhabitants and density of population; criminal activities and traffic accidents and fatalities. So far as these activities are concerned, the valley area is considered to compare favorably with any other section of the city.

Health:

The Los Angeles City Health Department has a central office in the Valley Municipal Building at Van Nuys. Assigned to it are a doctor, 2 nurses, 1 clerk and 4 inspectors. At Tujunga the department has a part-time doctor, a nurse and an inspector in the city hall, and a nursing station where child hygiene and tuberculosis clinics are held regularly.

The doctors do general field work in diagnosis and caring for indigents. The nurses carry on a complete public health nursing service in the field, and are in attendance at all child hygiene, tuberculosis and venereal disease clinics. Four of the inspectors do general housing, sanitation and quarantine inspection work. One inspector is assigned to the inspection of meat markets and poultry slaughter houses throughout the valley.

Three tuberculosis clinics are held each week in the valley area, as are also two child hygiene conferences and two venereal disease clinics.

The department asserts the growth of population has been so rapid during the past three or four years that its present staff is inadequate for all the work that should be done in the valley, but it hopes soon to increase its facilities in each current line of service.

Sewer Facilities:

Storm water is carried on the surface and sewers are used to handle only domestic and industrial sewage.

There are approximately 1400 miles of dedicated streets in the valley area while only about 150 miles of sanitary sewers are available for use. The outfall sewer, designed to serve the entire valley, has been constructed. In general, the North Hollywood community, the Van Nuys townsite, and a narrow strip of subdivided territory south of Ventura Boulevard from Sepulveda Boulevard easterly, are about 90 percent sewered. The outfall main was installed for the eastern area in 1931; the western extension was made in 1933-34. The expectation is that the capacity of this main will meet requirements of the area west of Van Nuys for 10 to 15 years; for the area east of Van Nuys the present capacity is expected to serve, say, 25 years.

Plans are being prepared for the sewering of the Reseda and Canoga Park business districts, but according to the office of the City Engineer, all extensions of service depend upon the future development of the areas involved and will have to be initiated and financed by the property owners in such areas. Since the sewage of areas not now served by the outfall main is diverted to cesspools, it is possible that a continuation or wide extension of the recent movement of population will force the early addition of a substantial mileage of sewers to the present system. Such a possibility would be strengthened by a growth of industry necessitating the disposal of liquid wastes, such as would be produced by certain types of factories.

Electrical Service:

Electrical service for power and light is practically universal throughout the valley. Various unoccupied tracts have no distribution facilities, but these may be provided under the rule governing extensions of lines which is utilized by subdividers.

The rates charged in the San Fernando Valley are the same as in the city proper, and average much lower than those charged in most other metropolitan, as well as rural, sections of the United States. For homes having eight or fewer lighting circuits (representing more than 99 percent of all Los Angeles homes) the present monthly rates are as follows: 4.4¢ per kwhr. for the first 35 kwhrs.; 2.2¢ per kwhr. for the next 65 kwhrs.; 1.5¢ per kwhr. for the next 100 kwhrs.; 1.25¢ per kwhr. for all additional kwhrs.; 0.70¢ per kwhr. for "approved" electric water heaters separately metered. Minimum charge: 55¢ per consumer.

Gas Service:

As in the case of water and electricity, gas for industrial and domestic use is available throughout the valley, although tracts now unoccupied will have to be reached by extensions of present distributaries when developed. There are now 29,350 connected gas meters. Gas-distribution mains varying from 2 to 8 inches in diameter comprise 650 miles, while mains varying from 12 to 26 inches in diameter comprise 80 miles.

Rates charged for general domestic and commercial service vary. In the portion of the valley generally east of Balboa Avenue (except the Tujunga-Sunland section adjacent to Foothill Boulevard), including North Hollywood, Van Nuys and the area surrounding San Fernando, the rates are as follows:

First	1,000 cu.ft.	per meter per month,	8.5¢ per 100 cu.ft.
Next	1,400 cu.ft.	per meter per month,	8.0¢ per 100 cu.ft.
Next	2,600 cu.ft.	per meter per month,	6.9¢ per 100 cu.ft.
Next	10,000 cu.ft.	per meter per month,	6.0¢ per 100 cu.ft.
All over	15,000 cu.ft.	per meter per month,	5.2¢ per 100 cu.ft.

The minimum charge is $0.80 per meter per month, except where the conditions are special; i.e., when several domestic-service meters are involved in a single contract.

In the Tujunga-Sunland section and the Valley area generally west of Balboa Avenue, the rates are as follows:

First	1,000 cu.ft. or less per meter per month,	$1.00
Next	1,000 cu.ft. per meter per month,	8.5¢ per 100 cu.ft.
Next	8,000 cu.ft. per meter per month,	7.0¢ per 100 cu.ft.
Next	10,000 cu.ft. per meter per month,	6.5¢ per 100 cu.ft.
All over	20,000 cu.ft. per meter per month,	5.5¢ per 100 cu.ft.

The minimum charge is $1.00 per meter per month, except where the conditions are special; i.e., where several domestic-service meters are involved in a single contract.

Public Libraries:

Eighteen centers are maintained in the valley by the Los Angeles Public Library. These are comprised of three branches housed in city-owned buildings and staffed with trained employees, and 15 stations which are simply collections of books in the care of local custodians who receive nominal compensations ($5 to $50) per month.

The three branches are Van Nuys, Sidney Lanier, and Canoga Park. Statistics indicating the use made of each are shown below:

Van Nuys branch occupies an attractive Spanish building at 14555 Sylvan Way. Annual circulation (1937-38), 186,134 volumes. Books owned, July 1, 1938, 14,360. Hours open per week: 1 to 9 p.m. Mondays to Saturdays; total 48 hours. Card holders, July 1, 1938, 6,907. While this branch ranks fifteenth among the 48 branches in the matter of total circulation, each book circulated 12.96 times per year, making it third in turn-over. The staff consists of one trained branch librarian, one full-time trained children's librarian, two full-time clerical library aids, one half-time page, one full-time janitor.

Sidney Lanier branch occupies its own building at 5211 Tujunga Ave., North Hollywood, in a park next to the playground. Annual circulation (1937-38), 184,735 volumes. Books owned, July 1, 1938, 16,259. Hours open per week: 1 to 9 p.m. Mondays to Fridays; 9 a.m. to 1 p.m. Saturdays; total 44 hours. Card holders, July 1, 1938, 7,098. This library ranks sixteenth in circulation, but in book turn-over it is seventh, each book going out 11.36 times in the last fiscal year. The staff consists of one branch librarian, one reference librarian, one children's librarian (works 4 days at Sidney Lanier and 1 day at Canoga Park), one clerical library aid, one half-time janitor (since outdoor work is done by Park Department), one 3/4-time page.

Canoga Park branch occupies a Spanish building with small story-hour room at 7260 Owensmouth Avenue, Canoga Park. Annual circulation (1937-38), 38,951 volumes. Books owned, July 1, 1938, 5,619. Hours open per week: Mondays, Tuesdays, Wednesdays, Fridays and Saturdays, 2 to 5 p.m.; Mondays, Wednesdays and Saturdays, 7 to 9 p.m.; closed Thursdays; total 21 hours. This is the smallest of all the branches, as to both circulation and book collection, but its percentage of fiction read is largest in the system. The staff consists of one full-time clerical library aid, one children's librarian for 1 day each week, one half-time janitor.

The 15 station collections, located at the addresses shown below, are accessible at the hours indicated. The total number of hours these stations are in service per week is 127.5. The total number of books made available through them is 17,000.

PUBLIC LIBRARY STATIONS IN SAN FERNANDO VALLEY

Name	Address	Hours when Available	No. of Books
Chatsworth	21732 Devonshire Chatsworth	Mon.Wed.Fri. 2-5:30 Mon. 7-9	1600
Encino	16947 Addison Ave. Van Nuys (in school)	Tues. Fri. 1:30 -4:30	700
Granada	10706 Whitecak Ave. Granada	Tues. 3-6:30	900
Hansen Heights	9900 Wheatland Ave. Roscoe (in school)	Fri. 2-4:30	450
No. Los Angeles	8879 Reseda Blvd. North Los Angeles	Mon.Wed.Fri. 2-5 Wed. Fri. 7-9	1600
Pacoima	11065 Van Nuys Blvd. Pacoima	Mon. Tues. Fri. 2-5	700
Reseda	7130 Reseda Blvd.	Tues. Fri. 2-5:30 Fri. 7:30-9	1450
Roscoe	In Playground Bldg.	Mon. 1:30-5:30 Thurs. 6:30-8:30 Sat. 1:30-5:30	750
Saticoy	12900 Saticoy St. (North Hollywood in school)	Fri. 1-4	450
Stonehurst	In Playground Bldg.	Wed. 7:30-9:30	225
Sunland	10451 Oro Vista Ave. Sunland	Mon.Wed.Fri. 2-5:30 Mon. Fri. 7-9	2600
Tarzana	18553 Collins St. Tarzana	Tues. Fri. 2-5	800
Tujunga	7212 Valmont St. Tujunga	Mon.Tues.Wed.Thurs. Sat. 1:30-6 Mon.Wed.Sat. 7-9	3400
Vinedale	10150 La Tuna Canyon Road (Roscoe in school)	Tues. 9-12 Fri. 2-5:30	875
Winnetka	8264 Winnetka Ave. Canoga Park (in school)	Tues. Fri. 1:30-4:30	500

North Los Angeles, Sunland and Tujunga stations do much reference work with high-school students. During July, August and September, questions answered, were: ready reference, 358; research, 215; advisory, 1019. Sunland and Tujunga had reading clubs for the younger children during the summer. Eighty children were registered in the club at Tujunga and read 748 books. Corresponding figures for Sunland are not available but were probably a little lower.

Municipal Playgrounds and Recreation Centers:

Los Angeles municipal playgrounds are general public recreation centers, open to the enjoyment of persons of all ages. Playgrounds are in use daily throughout the year. Most of them are also equipped for recreation in the evening indoors within community buildings, or outdoors on lighted areas. Competent recreation directors are on duty at the playgrounds to provide adequate supervision and protection for children, and leadership for youth and adults. Playgrounds aspire to be the centers of the community recreation life in the districts they serve.

The City Charter allocates to the Playground and Recreation Department 6 cents out of the total municipal tax rate for general purposes of $1.25. This rate yields the Department approximately $800,000 per year, or an average contribution of fifty-two cents for each Los Angeles resident.

Municipal pools and playgrounds are located as follows, where special recreational facilities are afforded as indicated:

Fernangeles, 8851 Laurel Canyon Boulevard. Community clubhouse and pool, baseball diamond, softball diamond, football field.

North Hollywood, 5301 Tujunga Boulevard. Community clubhouse and pool, baseball diamond, softball diamond lighted for night use, tennis courts lighted for night use, football field.

Reseda, 18411 Victory Boulevard. Community clubhouse and pool, baseball diamond, softball diamond lighted for night use, football field.

Roscoe, 8133 Vine Avenue. Community clubhouse and pool, softball diamond lighted for night use, tennis courts lighted for night use.

Stonehurst, 11101 Wicks Avenue. Community clubhouse and baseball diamond.

Van Nuys, 14301 Van Owen Boulevard. Tennis courts and softball diamond lighted for night use.

AGRICULTURAL CHARACTERISTICS

Early History

The earliest agriculture of consequence in the area was that initiated by the Mission fathers and their associates. At the Mission of San Fernando, founded in 1798, grapes, figs, olives, and garden crops were the most important special crops, but grain and a number of other necessary farm products were also grown. Irrigation was practiced as far as the water supply permitted. This early agriculture was localized and was developed under great difficulty.

Cattle- and horse-raising were extensive industries for many years after agriculture became established, continuing to be important until about 1850; and sheep-raising was given considerable attention during the latter part of the live-stock era. Much of the area early came into private ownership through land grants several of which comprised many thousands of acres apiece. Some of these grants were either joined or divided in ownership, but others remained intact up to recent decades. Large individual holdings continued to exist, and this persistence had its influence on the progress of settlement and on agricultural practices. An important transition in the industries of the valley occurred about midway in this history, when stock-raising gave way to the production of dry-farmed grain, largely wheat and barley. The acreages devoted to irrigated or specialized crops remained small or increased very slowly; in fact, the shift became so complete that most of the tillable area was finally devoted to grain production, other agriculture being relatively unimportant.

Advent of Irrigation

Transformation of agriculture from the types just described into the intensive types now existent on so wide a scale could not have been effected without such a water supply as was made available by construction of Los Angeles aqueduct across it and provision for use of the Owens River water, so transported, for "intermittent" 1/ irrigation throughout the valley. At the time the aqueduct was built its capacity and the water supply were both substantially in excess of the domestic and industrial needs of the city, though the rapid growth of population presaged eventual absorption of the entire supply for those uses. Until that time arrived, however, it appeared possible to use the surplus water for irrigation, and the large acreage of San Fernando Valley offered an attractive opportunity for such use.

A further advantage of irrigation use in San Fernando Valley was the possibility of recovering from one-fourth to one-third of the water applied and its resale for domestic use in other parts of Los Angeles. This course was recommended by the Board of Consulting Engineers as preferable to a plan of selling the surplus waters at a higher price to other agricultural areas then, as now, outside Los Angeles, and from which no return waters would come back to the city. The plan has worked out as anticipated, and a substantial contribution to the supply available to domestic and other users below the San Fernando Valley area is made, at small cost, in the form of these return waters. Legal requirements compelled restriction of this intermittent service to lands within the city, and it was primarily to satisfy those requirements that the valley so soon became a part of the West's largest metropolis.

1/ The term used in the city ordinances setting rates for water.

The aqueduct itself was finished in the autumn of 1913, but the first sale of irrigation water in the valley was not made until nearly two years later, as the aqueduct construction had not included a distribution system to serve the valley lands. To provide such distribution, Los Angeles County Waterworks District No. 3 had been formed in 1913, the first such enterprise to be organized under the waterworks district act. Its specific purpose was to construct a water distribution system from the aqueduct for all lands in San Fernando Valley except the city of San Fernando and the "Mission" district, the latter comprising all the old San Fernando Mission area. The entire area was annexed to the city of Los Angeles on May 4, 1915, and the distribution system, constructed at the expense of Los Angeles County Waterworks District No. 3, has since been operated as a part of the city system.

Under the terms of the waterworks district act, construction of the works of county waterworks districts is under the jurisdiction of the board of supervisors of the county in which the district is located. However, in the case of this district, the task of constructing the works was delegated to the Board of Public Service Commissioners of the City of Los Angeles. Bonds for paying the cost of construction were voted by the district in the amount of $2,604,000, these bonds being dated February 1, 1916 and maturing at the rate of $84,000 annually from 1919 to 1949, with interest at 6 percent. Interest and principal of these bonds were made a charge against the lands in the district, to be raised by an ad valorem tax. Operation, maintenance, and betterments became an obligation of the water revenues of the Department of Water and Power, the same as in any other part of the city.

The system of Los Angeles County Waterworks District No. 3 was mainly built during the period July 1, 1915, to June 30, 1917, and was practically complete by the fiscal year 1917-18. Sale of water for irrigation in San Fernando Valley was commenced in 1915. In the previous year about 3,000 acres in the area included within the district was irrigated from local sources.

In addition to Los Angeles County Waterworks District No. 3, several municipal improvement districts, notably Nos. 2 and 9, all in or adjacent to San Fernando Valley have distributed water for irrigation, as well as for domestic use. In each case the source of water has been the Los Angeles aqueduct system. They are all operated by the city of Los Angeles, although each has its separate bond issue chargeable against the lands within its boundaries.

Municipal Improvement District No. 2 comprises the "Mission" district, the area included being about 11,000 acres. When the improvement district was formed the area was obtaining its water supply from wells and this was entirely being applied to citrus lands. The distribution system from Los Angeles aqueduct was constructed by the Board of Public Service Commissioners of Los Angeles, along with the system of Los Angeles County Waterworks District No. 3. The cost was within the estimate of $390,000, the amount of the bond issue authorized in 1916. This issue was dated December 1, 1916, bore interest at 5 percent per annum, and had maturities from 1917 to 1946 at the rate of $13,000 annually.

The area embraced within the district was annexed to the city of Los Angeles in 1915. Irrigation service was made subject to the same rates and service as in Los Angeles County Waterworks District No. 3.

Municipal Improvement District No. 9 covers the Hansen Heights area lying east of Tujunga Wash. It is now within the city limits of Los Angeles, but was not included in the original San Fernando Valley annexation. A bond issue of $150,000 for construction purposes was voted in 1923. The bonds bore interest at 5½ percent per annum, maturing at the rate of $4,000 annually from 1924 to 1959, and $6,000 in 1960.

In addition to the construction financed by Los Angeles County Waterworks District No. 3 and the several municipal improvement districts, the city progressively acquired control or ownership of a number of small community irrigation and domestic-supply systems at various places in the valley, and these were promptly coordinated with the major system.

The construction of the whole distribution network was carried on with remarkable speed, and service to practically the entire valley area was available by mid-summer of 1917. (The comprehensive scope of the distributaries is shown graphically by Figure 9.) Utilization of the service followed with like rapidity, so that the 3,000 acres in the waterworks district area which had been irrigated prior to its organization was increased to ten times that acreage by 1917, and the Board of Public Service Commissioners reported a year later that

FIGURE NO. 9

WATER DISTRIBUTING SYSTEM OF THE LOS ANGELES BUREAU OF WATER WORKS AND SUPPLY IN THE SAN FERNANDO VALLEY.

nearly 75,000 acres was receiving the flow of the aqueduct.[1] This was the era of high prices for foodstuffs created by the World War, and San Fernando Valley felt the stimulus of war needs especially. For example, in 1918 the mechanical constructor reported 35,000 acres of beans and 12,000 acres of potatoes -- acreages approximately duplicated the following year but not approached since then. Whether or not the slump of farm prices in the early 20's was responsible, or whether it was due to the rapid advance of subdivision activities and the transformation of farming areas into small residential holdings, the irrigated acreage declined thereafter to a "net" (as contrasted with "rotated") of some 50,000 acres in 1930. Up to the present year the figure has since varied between a low of 44,200 acres in 1932 and a recent high of 48,200 acres in 1936.

Early in its history, the district experienced some of the usual difficulties of new irrigation enterprises. The shifting of the area from a dry-farming practice to the practice of irrigation was at first marked by an excessive use of water, partly induced by faulty leveling of the land and the inexperience of many of the farmers with the handling of water. These faults were soon corrected. Since the distribution was practically all by means of underground pipes, its control was easy. Meters were presently installed by which the water could be measured accurately to each service, and rates were established under which the water actually delivered was sold. Wasteful use is unnecessary (as well as costly) under such a system, and little waste is now evident.

1/ Perhaps representative of rotated- and inter-cropping on a smaller net area.

Transformation Brought about by Water

It has only been within the last two decades that most of the western two-thirds of the valley has been subdivided and made available for farming in relatively small tracts. With the advent of irrigation, broad valley slopes, formerly continuous grain fields, were rapidly split up into small farms or home acreages, and the improvements ordinarily accompanying a rapid increase in population were made. A substantial section of the area in this way reached the hands of small owners and was developed along the lines of intensive agriculture. In this area the change was remarkable, consisting of a sudden break from a region of very large land holdings, mainly in its original condition, to one of closely cultivated small acreages. This process was accelerated during the period of phenomenal growth of Los Angeles, but was likewise halted by the general depression early in the present decade. Its recent resumption in a measure began where the former movement slackened and so far has affected especially the areas then in process of subdivision, many of which lay idle meanwhile.

During the era of transformation an important central belt from Canoga Park to Van Nuys rapidly changed from grain to sugar beets, beans, melons, pears, apricots, peaches, and many other crops. The southeastern section was transformed into small holdings devoted to peaches, apricots, walnuts, grapes, melons, alfalfa, and a wide variety of garden crops and fruits. In the northern areas around San Fernando and east and west of that city, what became the most important plant-

ings of oranges and lemons in the valley were made. The lands remaining uncultivated usually were areas of relatively inferior soils or unfavorable topography. Some of the valley slopes between San Fernando and Burbank are still untilled; this is true also of parts of the continuous rim of hilly land surrounding the valley or partly in it, as the Verdugo Mountains.

Present Status and Scope of Agriculture

Today practically all the crops of the valley are income producers. Despite their wide diversity considered together, they represent a specialized type of agriculture. A range of cropping is practiced by the truck growers both in the matter of rotations to effect fertilization and combat diseases and pests [1], and in producing more than one crop a year on limited acreages. In the early history of the valley, especially when the orchard trees were small, intercropping was common, but as is shown by Table 8, this practice has declined progressively in recent years, while "rotation" or double-cropping has barely held its own. The area within a radius of several miles from San Fernando still contains nearly all the larger citrus orchards, but a number of sizable groves are in the western areas, and small plantings exist along the southern valley-fringe. Both Navel and Valencia oranges are grown, as are also lemons and some grapefruit [2]; all citrus trees together total nearly one-fourth the crop areas of the valley. The citrus acreage has grown slowly but steadily, and is now at its maximum.

1/ Especially a more-or-less generally prevalent nematode infestation which constitutes one of the valley's most troublesome agricultural handicaps.

2/ In the approximate proportions of 2 orange acres to 1 lemon acre and 7 orange acres to 1 grapefruit acre.

Table 8. -- Trend of double- and inter-cropping in San Fernando Valley, Calif., 1925 to 1937. 1/

Year	Irrigated Area			
	Primary Crop	Secondary Crop	Inter-crop	Total "Rotated"
	Acres	Acres	Acres	Acres
1925	57,929	2,445	9,705	70,079
1926	50,611	4,020	9,490	64,121
1927	45,299	2,543	6,314	54,156
1928	51,358	2,792	6,208	60,358
1929	53,194	2,609	5,397	61,200
1930	50,738	3,690	3,931	58,359
1931	48,610	2,797	2,853	54,260
1932	44,209	2,114	1,873	48,196
1933	44,074	2,287	1,624	47,985
1934	45,508	2,537	1,673	49,718
1935	45,709	2,237	1,227	49,173
1936	48,226	3,125	717	52,068
1937	46,468	2,117	494	49,079

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

These trees are largely in loam and sandy loam soils, and invariably irrigation is needed for them. The location of citrus orchards is influenced by frost conditions. (See Fig. 3). The northern part of the valley, around the bases of the encircling hills, is most favorable, but protected localities elsewhere, notably along the southern boundary, have been found suitable for growing the citrus fruits, and recent plantings, all involving small acreages, have been made in that section. Organic matter is supplied by making applications of manure or by plowing under cover crops, and in some orchards commercial fertilizer is used.

As a group, deciduous orchards have for some years been of declining importance, and now comprise only about one-third of the acreage they represented 10 years ago. However, peaches are grown in various parts of the valley. For the most part they are on soils of sand, sandy loam or fine sandy loam. Some of the very sandy soils retain water remarkably well, considering their texture, and give good results with this fruit. Limited acreages of apricots are still grown also. The fruit is canned, dried or sold fresh, the disposition of the crop sometimes being influenced by market conditions at the time of ripening.

Walnuts are grown on an aggregate of several thousand acres. Soils of sandy loam and fine sandy loam textures predominate where the best plantings were made.

An exceptionally large olive grove is northwest of San Fernando, and others of relatively small size are elsewhere in the valley; however, most of the olives are grown without irrigation. Many of

the plantings were made on very light textured soils where most other tree crops can not be produced without irrigation.

Many vineyards are largely localized in the vicinity of Burbank and in the Sunland region, but smaller acreages appear elsewhere. Some grapes are grown without irrigation in this valley; they are nearly always located on rather sandy, gravelly or stony soils that are hardly capable of producing any other fruit without irrigation. Table, raisin, and wine varieties are grown, but the wine grapes predominate.

Nearly all the alfalfa acreage is in the south half of the valley, and is represented by soils that are deep and moist, so that it is possible to produce good yields with relatively light irrigation. Statistics showing total acreage of this crop have been fairly stable for several years and may remain so for a while, as the water requirements of alfalfa on all the more sandy, thoroughly drained soils to which it might otherwise migrate would be much the greater. Moreover, the competition of alfalfa-growers in other areas accessible to Los Angeles markets, where the costs of raising alfalfa are relatively low, is likely to operate against a substantial increase of the alfalfa acreage in this area. However, because of its important function as a soil-builder and its value in various crop rotations, the stability of this acreage is influenced by other factors besides those favorable to the profitable production of hay. Much of the alfalfa is sold green to the many local dairies, chicken ranches and rabbit hutches, although some is baled and sold outside the valley.

Sugar beets were a crop of varying importance for several years, but lately have not occupied so extensive an acreage as in the years just following the time when the present adequate irrigation supplies became available.

In addition to these main crops a large number of garden and truck crops are grown in considerable quantities. Lima beans, although representing a widely fluctuating acreage, have been one of the most important crops in the valley; and beans and miscellaneous truck crops in some years have represented fully half, or even more, of the total cropped area. Strawberries and various bramble berries, nursery stock, and other miscellaneous crops are grown, while roses and other flowers produced commercially represent several hundred acres in all.

Some agricultural products are marketed locally, and others are shipped away. Citrus fruits, dried fruits, olive products, and wines are shipped to various parts of the nation and abroad. Many of the canned fruits, beans, nuts, and sugar-beet products also are sent to more or less distant markets, but the garden crops, dairy products, and greenfruits usually are consumed locally or sold in major Los Angeles markets.

The recent history of agriculture in the valley is graphically shown by Figures 10 to 12, and statistically by Table 9.

The following paragraphs are excerpts from the 1938 (unpublished) report of the Bureau of Water Works and Supply:

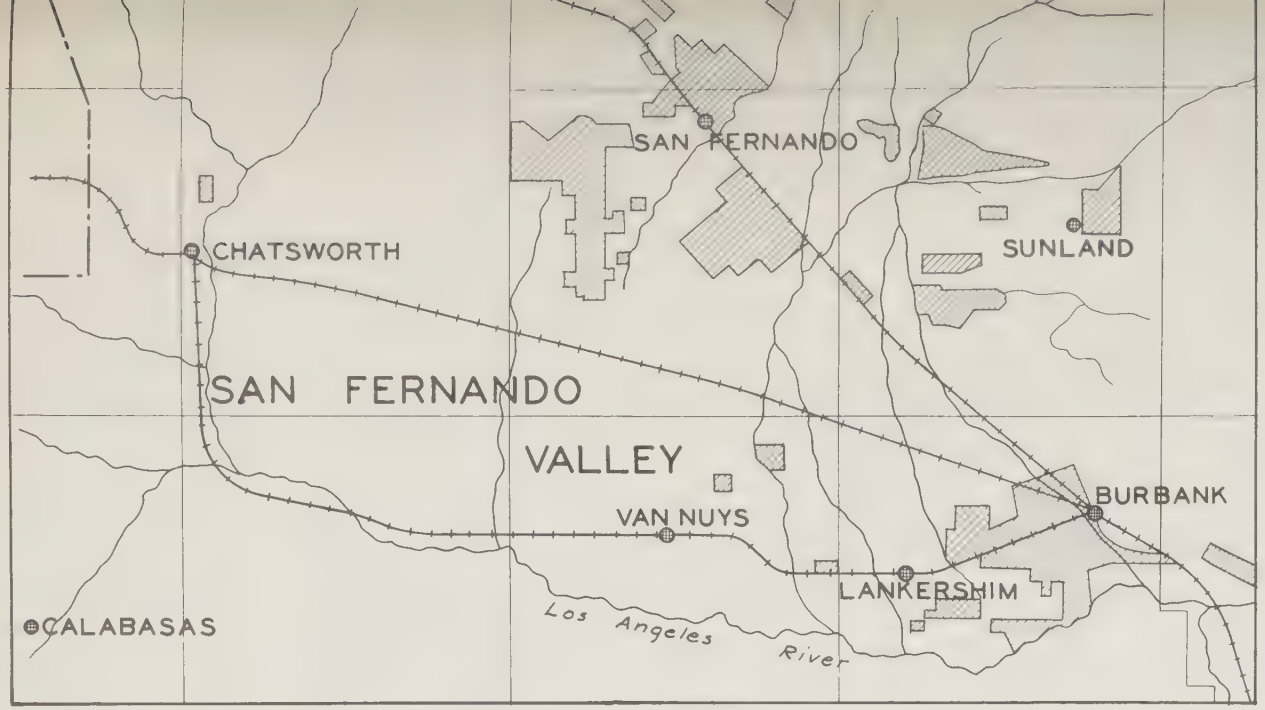


FIGURE 10. ---IRRIGATION DEVELOPMENT IN SAN FERNANDO VALLEY, CALIF., BEFORE AND AFTER CONSTRUCTION OF LOS ANGELES AQUEDUCT SYSTEM.

AT LEFT: AREAS IRRIGATED IN 1912. (AFTER PLATE III, O.E.S. BUL. 254, U.S.D.A., "IRRIGATION RESOURCES OF CALIFORNIA," ETC., BY FRANK ADAMS. 1913.)

AT RIGHT: AREAS IRRIGATED IN 1920. (AFTER IRRIGATION MAP OF CALIFORNIA, 1920. U.S. DEPT. OF AGRICULTURE. BUREAU OF PUBLIC ROADS, IRRIGATION INVESTIGATIONS, 1922.)

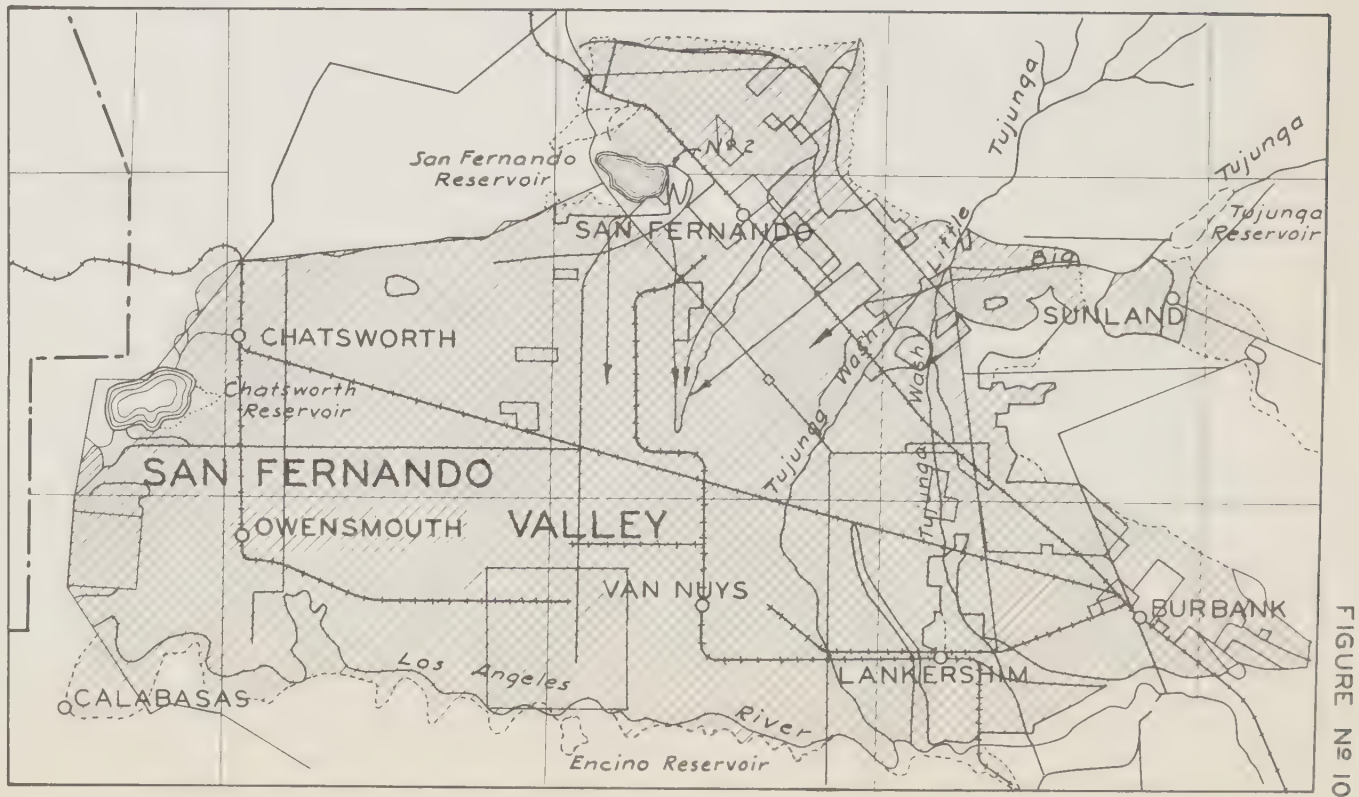
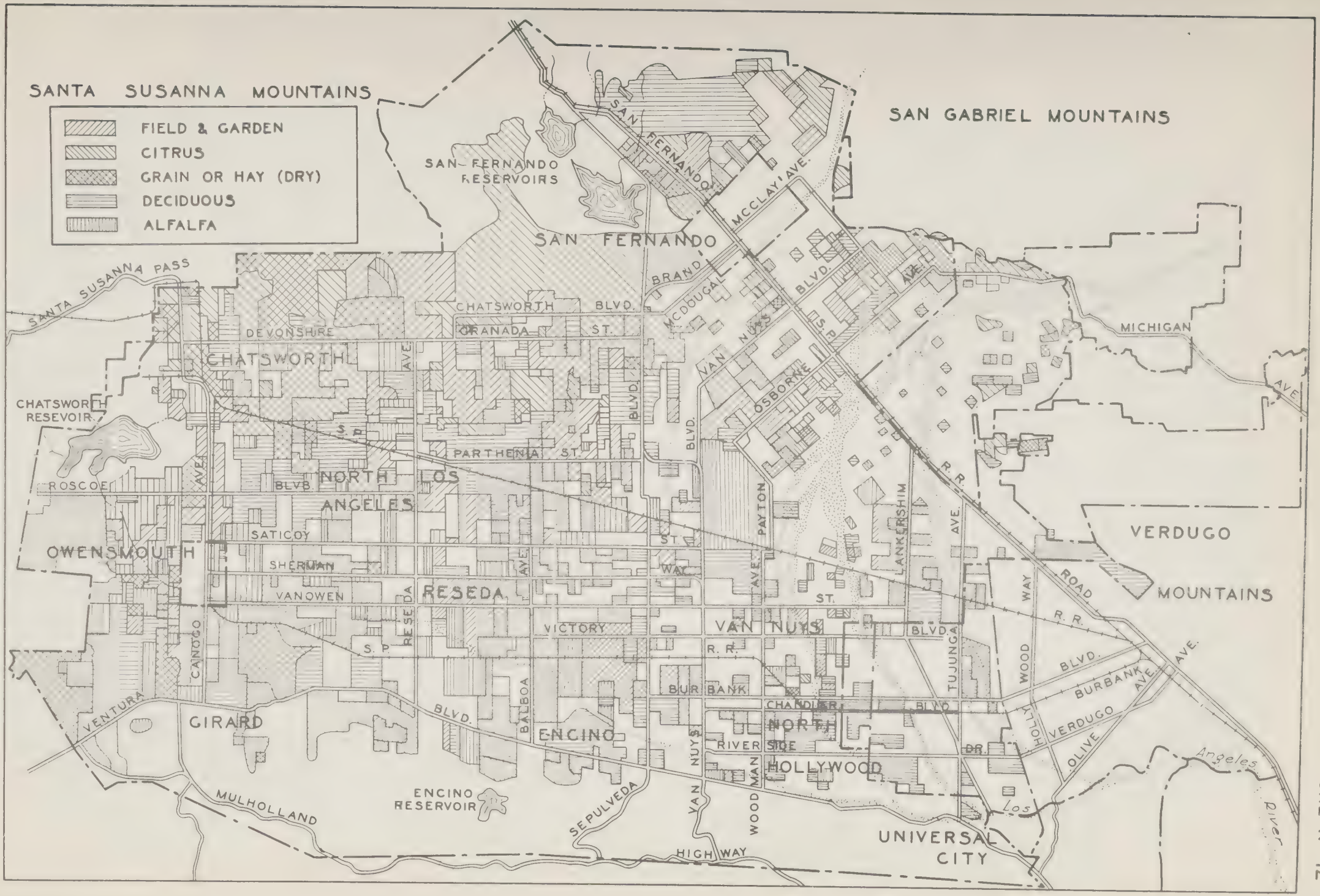


FIGURE Nº 10

FIGURE № 11

IRRIGATED CROPS IN SAN FERNANDO VALLEY, 1932, (AS MAPPED BY DIVISION OF WATER RESOURCES CALIFORNIA STATE DEPARTMENT OF PUBLIC WORKS FOR ITS BUL. NO. 43, "VALUE AND COST OF WATER FOR IRRIGATION IN COASTAL PLAIN OF SOUTHERN CALIFORNIA," BY FRANK ADAMS AND MARTIN R. HUBERTY).



DISTIBUTION OF IRRIGATED AREAS IN SAN FERNANDO VALLEY, CALIF., 1938

FIGURE Nº 12

Table 9. -- Distribution of irrigated acreage in San Fernando Valley, Calif., by years, 1930-1937, with partial distribution for 1922, 1928 and 1929. ("Intermittent" irrigation from Los Angeles aqueduct only.) 1/

Year	Total rotated	Total Net	Alfalfa	Asparagus	Beans	Sugar Beets	Citrus Trees	Deciduous Trees	Fig Trees	Grapes	Olive Trees	Roses and Bulbs	Walnut Trees	Miscellaneous Truck
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1922	56,278	---	7,078	---	---	---	8,495	---	---	---	---	---	---	---
1928	54,156	---	5,384	---	12,340	---	9,084	2,447	---	---	---	---	5,468	---
1929	53,194	---	6,719	---	15,303	---	9,451	2,599	---	---	---	---	8,281	18,847
1930	58,359	50,738	6,267	445	12,828	---	9,592	1,632	319	853	826	614	7,701	17,282
1931	54,260	48,610	5,756	397	10,833	517	10,273	862	279	659	767	605	7,110	16,202
1932	48,196	44,209	4,799	505	2,712	624	10,093	1,090	240	492	752	649	7,081	19,159
1933	47,985	44,074	4,723	575	5,838	1,448	10,087	799	214	1,005	799	583	6,402	15,512
1934	49,718	45,508	5,169	559	6,061	1,851	10,158	963	257	991	280	632	7,068	15,729
1935	49,173	45,708	6,025	611	5,307	1,207	10,260	960	253	545	545	671	7,062	15,727
1936	52,068	48,226	6,224	860	7,091	857	10,509	951	243	474	795	696	7,559	15,809
1937	49,079	46,468	5,491	886	8,382	287	10,774	792	172	383	821	708	7,018	13,365

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

"The tabulated values given below are for the calendar year 1937. The greatest irrigation demand and a large amount of new planting of agricultural crops near the close of the fiscal year makes an accurate segregation of acreages and water duties impossible as of June 30th.

"A net area of 48,468 acres was planted, and a second and inter-crop area of 2,611 acres giving a total of 49,079 rotated crop acres. The net area planted in 1937 is 242 acres greater than that for the year 1936.

"The total rotated acreage consisted of the following principal crops:

	Crop	Acres	Revenue	Duty	Ac.Ft.	Percent of Total
	Alfalfa	5,491	$70,752.50	1.97	10,835	15.6
	Asparagus	886	8,798.20	1.52	1,347	1.9
	Beans	8,382	53,623.33	.98	8,212	11.8
	Beets (Sugar)	287	1,564.80	.84	240	0.4
	Citrus	10,744	125,744.28	1.79	19,257	27.7
	Deciduous	792	3,068.18	.59	470	0.6
	Figs	172	1,269.99	1.13	194	0.3
	Grapes	383	1,476.83	.59	226	0.3
	Olives	821	2,979.35	.56	456	0.7
	Roses & Flowers	708	9,501.67	2.06	1,455	2.1
	Walnuts	7,018	42,620.12	.93	6,527	9.4
	Misc. Truck	13,365	132,712.60	1.52	20,323	29.2
1937	Total Rotated	49,079	454,111.85	1.42	69,542	100.0%
1936	Total Rotated	52,068	507,637.36	1.55	80,519	100.0%

"The average depth of water on the net area irrigated is 1.50 feet.

"Heavy rainfall (20.29 inches from December 14, 1936 to April 1, 1937) and approximately 2,500 acres less planting of truck and field crops has caused less demand for irrigation water. The demand for the calendar year 1937, was 10,977 acre-feet less than for the year previous.

"Bean acreage has suffered a large reduction. The record of the 1938 season shows an area of 4,500 acres as compared with 8,500 acres for the 1937 season.

"Sugar beet planting shows an increase for the 1938 season - 700 acres as compared with 300 acres for the 1937 season.

"Asparagus acreage is still increasing slowly each year. There was a total of 300 acres planted in 1928 and now there are 1,150 acres planted.

"Alfalfa, also, is increasing in acreage, 1,600 acres of new planting is shown by the current record. Some old fields are being plowed up but the new planting probably will mean a net increase of about 1,000 acres, which will bring the total alfalfa acreage under Aqueduct water to approximately 7,000.

"There has been a decrease in the planting of tomatoes in the current season; 2,500 acres for the 1938 season as compared with 3,100 acres for the 1937 planting season. Total acreage of miscellaneous truck crops remains about the same as for previous years.

"Walnuts and deciduous fruits continue to decline in acreage at the rate of from 200 to 250 acres per year. There is a tendency to balance this loss in prime crop acreage by an increase in citrus tree planting. About 200 acres of new trees were planted in the Spring of 1938."

Table 9 and the quotation above reflect only the acreage served by "intermittent" irrigation from Los Angeles aqueduct. In addition, about 4,000 to 4,500 acres is irrigated in small lots (averaging perhaps no more than 1 acre each) by a "combination irrigation and

domestic" service, about 3,000 acres is served by individually owned wells (of which there are about 40, pretty well scattered) [1], and some 2500 to 3000 acres is dry-farmed. The net acreage in agricultural use is therefore about 10,000 acres greater than the figures appearing in the table.

Size of Farm or Farmed Unit

The only Federal Census figures indicative of the average size of the San Fernando Valley farms are those reported in 1930 for Los Angeles judicial township, a minor civil division coextensive with Los Angeles city. While this unit included other farming areas besides the valley, it is obvious that by far the greater portion of the farmed acreage reported for the township was representative of the valley. The number of "farms" was 2689 and their total area was 88,275 acres; area of cropped land harvested in 1929 (including unirrigated grain, etc.) was 56,435.

The farms recognized as such by the Bureau of the Census were 3 acres or more in size unless their products in 1929 had a value of $250 or more, in which case they might be smaller. Application of this restriction undoubtedly eliminated from the Census enumeration many small tracts to which water was delivered from the aqueduct system for the irrigation of crops included in tabulations appearing elsewhere in this report. The averages obtainable from the figures -- "farm", 32.8 acres; "crop land harvested" per farm, 21 acres -- would therefore have been too high if such numerous small tracts had been taken into account. However, the 21-acre figure would perhaps not be far from a 1930

1/ Pumping from these wells is mostly by electricity. Pump discharges average around 500 to 600 g.p.m., and lifts range from about 30 to 100 feet.

figure obtainable from the records of aqueduct service.

An examination of the crop survey records at the Van Nuys office of the Bureau of Water Works and Supply was undertaken to obtain a closer idea of the present size of the valley farms or farmed units, the 1937 records being used. The complete tabulations of these compilations appear in the Appendix, and they are referred to elsewhere in this report in the discussion of additional matters upon which they throw some light. While the necessary exercise of more or less arbitrary judgment in their classification eliminated some areas and so prevented exact agreement of totals with the totals reported in preceding tables, the results are nevertheless close approximations of present conditions.

The average farm or irrigated unit represented in the 1937 records had an area of 17.8 acres (compared with the 1930 Census average of 21 acres for "crop land harvested"), but 27 percent of the total number (2629) were less than 3 acres in extent; nearly 18 percent ranged from 3 to 5 acres; 21 percent ranged from 5 to 10 acres; 15 percent from 10 to 20 acres; and 19 percent were 20 acres each or larger. However, while the 0-3 acre group comprised the largest number of units, its acreage was only 2.8 percent of the total. The 3-5 acre group was 4.9 percent of the total; the 5-10 acre group, 10.4 percent; the 10-20 acre group, 13.7 percent; and the group of 20 acres or more was 68.2 percent. In brief, this examination showed that while less than one-fifth of the units were larger than 20 acres each, more than two-thirds of the total acreage was in units of 20 acres each or more.

Table 10 shows how the farms are distributed according to the water (or zanjero) districts outlined on Figure 13. The table and figure together emphasize the fact already stated generally, that the larger farms and the (relatively) extensively farmed areas are in the western and northern portions of the valley; the smaller units are typical, that is, of Districts 2, 3, 4, and 9. Appendix Tables A to K carry this detail still further, showing the size-group distribution by water districts for each principal crop.

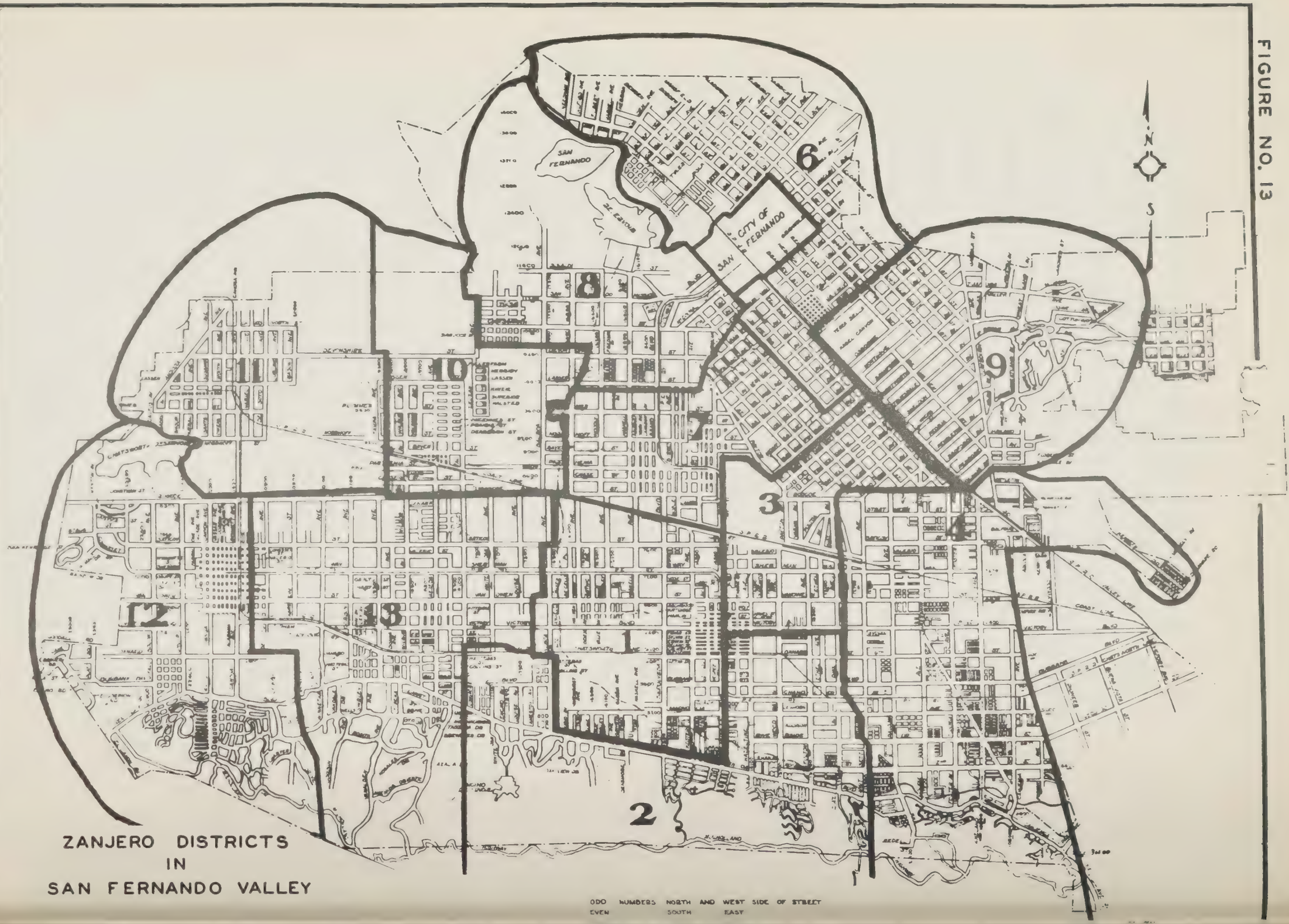
Table 10. -- Number of crop units in San Fernando Valley, total and average areas, by water (zanjero districts), 1937. 1/

District Number 2/	Units	Total Area	Average Size
	Number	Acres	Acres
1	262	5418.0	20.7
2	301	2643.5	8.8
3	335	1662.5	5.0
4	140	2084.0	14.9
6	212	3759.0	17.7
7	266	3246.5	12.2
8	286	5047.5	17.6
9	313	2787.5	9.2
10	212	4793.0	22.6
11	215	6649.0	30.9
12	193	5669.0	29.4
13	228	6077.5	26.7

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

2/ There is no District 5.

FIGURE NO. 13



ZANJERO DISTRICTS
IN
SAN FERNANDO VALLEY

The Irrigation System

The extent and comprehensiveness of the water production and distribution facilities operated in San Fernando Valley by the Bureau of Water Works and Supply are shown graphically by Figure 9 and statistically by the following summary. In a broad sense, the water "produced" in the valley is served to the downtown areas of Los Angeles and the major portion of the valley is served with Owens River water brought in by the Aqueduct:

WATER PRODUCTION PLANTS

Name of Plant	Type	Installed Capacity
North Hollywood	Wells	95 Sec.Ft.
Mission	Wells	6 " "
Crystal Springs	Infiltration gallery and wells	35 " " 1/
Headworks	Infiltration gallery and wells	45 " "
Pollock	Wells	10 " "
Rancho Tujunga	Infiltration gallery	4 " "

(Total mean annual production of water by these plants is equivalent to a continuous flow of 100 second feet)

1/ Well capacity - does not include gravity gallery water.

WATER DISTRIBUTION SYSTEM

(Owens River Water)

Type	Length
Gravity Canals	14 miles
(Maclay Highline - 4¼ miles)	
(Chatsworth Highline - 9 3/4 miles)	
Pressure Mains	1,031.3 miles
(Steel and Cast Iron Mains)	
4" to 14" = 902.8 miles	
16" to 78" = 128.5 miles	

WATER SPREADING AT TUJUNGA SPREADING GROUNDS AND AT GRAVEL PITS.

Total water spread from 1932 to date approximately 155,000 acre-feet.

SURFACE RESERVOIR STORAGE CAPACITY

Name of Reservoir	Capacity (Acre-feet)
Upper San Fernando	1,977
Lower San Fernando	20,500
Encino	3,229
Maclay	18
Girard	41
Chatsworth	10,650
	36,415

The San Fernando Reservoirs are at the terminus of the Los Angeles - Owens River Aqueduct. In addition to supplying domestic and irrigation water to the San Fernando Valley, the aqueduct supply to other parts of Los Angeles is distributed from these reservoirs via the San Fernando Main, the City Trunk Line and their various interconnections to the distribution reservoirs throughout the city.

TANKS FOR HIGH ELEVATION SERVICE

Name of Tank	Capacity (Gallons)	
Sunland	484,000	
Hansen Heights	517,000	
Alta Vista	464,000	
Granada	585,000	
Granada High	586,000	
Lakeside Park	7,300	
Topanga Canyon	208,000	
Beverly Glen	2,241,000	1/
Laurel Canyon	3,040,000	
Coldwater Canyon	2,255,000	1/

1/ Service to both sides of Santa Monica Mountain area.

PUMPING PLANTS-WHICH DELIVER WATER TO HIGH ELEVATION TANKS
(These are "booster" plants)

Name of Pumping Plant

Rancho Tujunga	Oroas	Alta Vista
Maclay	Granada No. 1	Granada No. 2
Lakeside Park	Girard	Kelvin Avenue
Donovan	Laurel Canyon	

Water Spreading

The water-spreading program of the Bureau of Water Works and Supply involves Owens River water only; no local waters are included.

Quantities spread depend on the available surplus winter flow of the aqueduct, although the facilities would care for 30,000 acre-feet per season. During the seven years spreading has been practiced, a total of 155,000 acre-feet, or a seasonal average of 22,143 acre-feet, has been added to the underground basin.

This water is of extreme importance to the irrigators of San Fernando Valley, because during emergencies the Vanowen Street wells, with their 95 second-feet capacity, can intercept and make it immediately available to the main portion of the city. Hence the supply thus made available in conjunction with the discharge of the stand-by wells in the Reseda area, precludes the possibility of future irrigation restrictions such as have occurred three times.

The following excerpt from the 1935 report of the Bureau of Water Works and Supply describes the operation of the spreading works in a year of normal rainfall:

> During the fiscal year spreading of Owens River Aqueduct water was carried on at the Tujunga spreading grounds and gravel pits. A total operation period of 221 days from November and through June contributed 30,040 acre-feet to the groundwater basin. An average of 136 acre-feet was spread daily during the operating period.
>
> The following tabulation shows the monthly distribution of water spreading, segregated as to the Tujunga basins or gravel pits, during 1934-35. All gravel pit spreading was concentrated at the Stonehurst and Farmdale pit.

	Tujunga Basins Acre-feet	Gravel Pits Acre-feet	Total Acre-feet	Average Second-feet
November, 1934	1,562	190	1,752	29.5
December, 1934	5,302	1,946	7,248	117.9
January, 1935	3,259	1,100	4,359	70.9
February, 1935	2,836	832	3,668	66.1
March, 1935	2,208	486	2,694	43.8
April, 1935	4,623	672	5,295	89.0
May, 1935	2,798	800	3,598	58.5
June, 1935	1,426		1,426	24.0
	24,014	6,026	30,040	41.5 (Year)

At the Tujunga spreading grounds, an average daily flow of 54.85 second-feet of Owens River water was absorbed on an average area of 17.43 acres. The average unit rate of percolation for the 221-day spreading period was 6.24 acre-feet per acre per day.

Seasonal average unit rates of percolation since the beginning of spreading operations in 1931, have been as follows: 1931-32, 6.15 feet; 1932-33, 6.92 feet; 1933-34, 5.51 feet; and, 1934-35, 6.24 feet; with an average of 6.205 acre-feet per acre for the four seasons.

The flood of March 2, 1938 broke over the levee of the Big Tujunga Wash and destroyed 67 of the 80 spreading basins. The average rate of percolation for the 1937-38 season was 6.03 acre-feet per acre. At the start of the 1938-39 season some of these basins were repaired and by means of ditch-spreading an average of 50 second-feet of Owens River water was being spread at this location.

Return Waters from Irrigation

A continuance of the irrigation program will involve what is considered by some as a subsidy extended to irrigators by the other classes of water users, and is actually justified to a considerable degree if not wholly by the value of the return waters. The easterly portion of the valley is composed of loose granitic sands and gravels which enable it to absorb the major portion of the flow of the Pacoima and Big and Little Tujunga Creeks. Owing to the fill characteristics, the ground water of this easterly section responds to the fluctuations of wet and dry seasons. That portion of the valley which is westerly of Van Nuys absorbs water slowly and is very retentive because it is composed entirely of materials from the surrounding sedimentary hills. The ground water of this area responds normally to wet and dry cycles rather than seasons. A large part of the irrigated lands overlie this tight valley fill.

During drought periods the water table of the easterly portion drops sufficiently to allow the irrigation return waters of the westerly area to move in.

It is this movement of return waters that has maintained a regulated increased flow of the Los Angeles River, notwithstanding drought periods, since the advent of Owens River water into the valley.

Crop Yields

Table 9 shows that nearly two-fifths (38 percent) of the net crop-acreage served by the aqueduct system in 1937 was represented by citrus and walnut orchards. Alfalfa occupied nearly one-ninth the area, while asparagus, beans and miscellaneous truck crops comprised nearly one-half the total.

A large part of citrus and walnut production is marketed through cooperative organizations. Records supplied by several of these agencies, representative of substantial proportions of the orange, lemon and walnut acreages, provide reliable measures of their production in recent seasons.

Field Crops. -- For the field crops no such reliable indices are available, nor can county statistics collected in 1930 and 1935 by the Federal Bureau of the Census be identified with San Fernando Valley units. Estimates only can be shown for such crops. Such estimates were obtained, in the study here reported, from well-informed County, State and Federal governmental sources, and the most conservative in each case is shown below. Harvested yields of some crops are influenced by market conditions, since in seasons when those conditions are favorable higher proportions of the actual crop are harvested than in poor years. This is especially true of lettuce and tomatoes. Hence it is difficult to obtain correct measures of the actual productiveness of the portion of the valley which is devoted to the important truck crops:

Estimated Average Yields, per acre of selected crops in San Fernando Valley

Alfalfa	5.5 tons
Tomatoes, canning	6.0 tons
ripes (for local market)	175 lugs
mature green stock	150 lugs
Asparagus	2500-3000 lbs.
Lettuce	80 packed crates
Carrots	1000 dozen bunches
Beans	16 sacks
Corn	300-350 lugs
Cantaloupes	200 standard crates
Squash	6.5 tons

Walnuts. -- Production of walnuts by the acreage marketing through the California Walnut Growers Association is shown in Table 11.

Table 11. Production of walnuts by member groves of California Walnut Growers Association, San Fernando Valley, Calif., 1933 to 1937.

Year	Total orchard-run	Proportion of culls	Proportion of culls in crop for State
	Pounds	Percent	Percent
1937	5,152,700	21.9	21.1
1936	2,699,900	39.4	22.2
1935	5,059,300	15.8	17.6
1934	3,559,500	33.2	20.2
1933	1,941,800	28.3	19.7
Average production	3,682,640	--	--
Average production per acre 1/	635	--	--

1/ Based on an average area of 5800 acres. Membership area in San Fernando Valley on September 21, 1938 was 6319 acres.

While average production was thus only 635 pounds per acre for the 5-year period, the range was wide, and the yield for the last year in the record (1937) was about 800 pounds per acre (assuming the known 1938 acreage represented no great change from the 1937 total). Since this figure is an average, it takes account of orchards producing substantially larger crops than 800 pounds per acre, as well as those yielding smaller harvests.

Citrus Crops. -- Average yields from the citrus orchards operated by members of San Fernando Heights Orange Association, for the last ~~three~~ 5 years, are shown in Table 12. The 1937-8 area involved was 1756 acres.

Table 12. -- Production of citrus fruits, per acre by member groves of San Fernando Heights Orange Association, 1933-4 to 1937-8.

Year	Navel Oranges		Miscellaneous		Valencia Oranges		Grapefruit	
	Acres	Average Yield Field bxs	Acres	Average Yield Field bxs	Acres	Average Yield Field bxs	Acres	Average Yield Field bxs
1933-34	249	182	20	282	945	183	82	143
1934-35	225	370	21	764	1080	409	139	256
1935-36	199	284	21	320	1273	122	139	140
1936-37	221	183	24	213	1243	74	143	195
1937-38	239	164	24	433	1344	189	149	143
Average	226	234	22	397	1177	190	130	178

Production figures for the lemon orchards operated by the San Fernando Lemon Association and the San Fernando Heights Lemon Association

have been combined in Table 13 to show average yields for the lemon orchards marketing through those agencies for the past five years.

Table 13. -- Production of lemons, by member groves of San Fernando Lemon Association and San Fernando Heights Lemon Association, 1932-3 to 1936-7.

Year	Total Area	Yield	
		Total	Average per acre
	Acres	Field-boxes	Field-boxes
1932-33	1682	448,126	266
1933-34	1663	577,351	347
1934-35	1812	746,130	412
1935-36	1800	448,708	249
1936-37	2200	388,971	177
Average	1831	521,857	285 1/

1/ An average yield of about 200 boxes per acre is expected by the San Fernando Heights Lemon Association in the current harvest.

COSTS OF CROP PRODUCTION

Cost-of-production studies have been made at intervals or consecutively by years for several of the principal crops, by Los Angeles County Farm Advisor M. B. Rounds and his assistants 1/, but

1/ Contributing to the cost tabulations in this chapter (i.e., Tables 14 to 19, inclusive) were Assistant Farm Advisors E. C. Moore (citrus), M. H. Kimball (walnuts), and A. F. Gillette (field crops).

(except perhaps for tomatoes) these have applied generally to Los Angeles County and not specifically to San Fernando Valley. Mr. Rounds and his staff are, nevertheless, intimately informed regarding agricultural conditions in the valley and their peculiarities, and have assembled many pertinent cost records. Their assistance in preparing the following estimates was therefore invaluable and is gratefully acknowledged.

Preceding sections of this report have presented estimates of average yields of crops, but these averages do not bring out the fact that yields actually vary in a wide range. Thus among the truck crops, while 80 packed crates of lettuce per acre (see page 59) is considered a fair estimate of the average yield, the range is actually all the way from 25 to 250 creates; and yields of asparagus have been as high as 5000 pounds per acre from the best plantings. Canning tomatoes may yield two tons or 20 tons per acre, and alfalfa in its prime may yield substantially more than 5½ tons, especially if provided sufficient water at the proper intervals.

Annual cash operating expenses vary correspondingly. In some orange orchards they may be as low as $100 an acre; in others, around $250. It is therefore difficult, perhaps impossible, to set up a statement of costs which can be taken convincingly as representative of any branch of the valley's agriculture, year in and year out. Hence the following group of tables (Tables 14 to 19 inclusive) are examples of segregated expenses for better than average operations. As

"standards" they are not representative of average but of better than average operations, not generally encountered in the valley but considered reasonably possible of attainment.

Table 14 is an example of the segregation of annual expenses in operating an above-grade orange orchard (not including interest on capital, managerial salary or tree-depreciation charge), on the basis of an annual yield of 300 field boxes (or 200 packed boxes) per acre -- notably higher, that is, than the averages shown in Table 12 but not impossible, as the yields of a few orchards are known to average from 350 to 400 field boxes per acre.

To arrive at possible earnings from the operations listed in Table 14, a return to the grower may be assumed at around $1.40 per packed box -- the average for the past eight years. This would produce a gross income of $280 per acre, or $82 more than the total ($198) of the listed costs. This margin ($82) would be available for interest on capital investment and managerial compensation.

From this calculation it appears that the general average yield of 200 field boxes per acre -- about 125 packed boxes -- results in an enterprise which permits the operator to receive very little or no net return on capital investment nor personal compensation other than in paying himself for the time he spends in cultural labor in his orchard. Orchards yielding less than the 200 field-box average probably show a net cash operating loss, not giving consideration to interest on capital and managerial compensation.

Table 14. -- A standard of costs of orange production in San Fernando Valley, Calif., based on an annual yield of 200 packed boxes (or 300 field boxes) per acre and on the assumption that not to exceed one-tenth of the valley's orange production is navels.

Material and Operation or Charge	Cost
	Dollars
Pruning and brush disposal	5.00
Cover crop-seed and planting	2.00
Manure, straw, etc., and application	12.00
Commercial fertilizer and application	15.00
Pest control, fumigation, dust, spray, etc.	20.00
Disease control	3.00
Frost protection	15.00
Cultivation and furrowing	10.00
Irrigation labor	6.00
Irrigation water charge (about 2 acre-feet) 1/	15.00
Taxes (orchard and equipment)	20.00
Overhead (except interest on net investment) 2/	10.00
Miscellaneous materials, new trees, etc.	5.00
Windbreak maintenance (10 percent of land area)	10.00
Total annual depreciation of equipment, buildings, etc.	15.00
Picking 300 field boxes	18.00
Hauling 300 field boxes	9.00
Total cost per acre 3/	198.00

1/ Actual range is probably from 10 inches per acre per year to 48 acre-inches per year in different orchards, with most in the 20-28 acre-inch range. For further pertinent data see tables 27 and 28.

2/ May be considered to include, in part, some interest on current operating capital outlay; also miscellaneous charges incidental to administration.

3/ This total ($198 per acre) is the equivalent of 78 cents per packed box per acre, which is the amount estimated to be received by the grower upon delivery of the fruit to the packing house. It does not therefore cover packing, refrigeration and advertising and selling costs ordinarily carried by the marketing organization.

The standards set up in Table 15 for lemons are closer to the average yields recently reported in the valley than the orange standards, but are subject to the same general qualifications already stated, as are also the calculations in the tables (16 to 19) representing other crops.

Importance of Water Costs and Taxes

Notable in the foregoing group of cost-of-production tables are the items representing cost of water and taxes. Neither need be considered as representing a definitely controlling item in the total costs for any of the crops listed. [1/] Together, they obviously comprise a substantial proportion of the total. Nevertheless, when set against similar records for other comparable localities, neither separately nor together do these two costs appear excessive in the case of the orchard crops; they are, in fact, quite closely in accord with customary expenditures in such comparable localities if the important fact be ignored that San Fernando Valley fruit yields are not as high in quantity nor (for some fruits) in quality as the yields obtained elsewhere with closely equivalent expenditures. Since yields are not equivalent, the fair agreement of costs on an acreage basis is, of course, misleading when taken as a measure of what the industry can support.

In the case of alfalfa the circumstances are distinctly different. The ability of alfalfa to produce liberally with an extremely economical use of irrigation water has already been noted; annual use by this crop is practically the same as the use by citrus trees. Alfalfa land, moreover, is of a general quality comparable to that on which the orchards subsist and tax valuations are set accord-

1/ The ratios of water costs to total production costs appear in Tables 14 to 19 as follows: Oranges, 7.5 percent; lemons, 5.8 percent; walnuts, 13.8 percent; alfalfa, 28.4 percent; lima beans, 12.2 percent; tomatoes, 9.8 percent.

Table 15. -- A standard of costs of lemon production in San Fernando Valley, Calif., based on an annual yield of 175 packed boxes (or 300 field boxes) per acre. 1/

Material and Operation or Charge	Cost
	Dollars
Pruning	12.00
Cover crop-seed and planting	2.00
Manure, straw, etc., and application	12.00
Commercial fertilizer and application	15.00
Pest control, spray, etc. (Sulphuring, dusts, and miscellaneous spraying)	30.00
Frost protection	25.00
Cultivation and furrowing	10.00
Irrigation labor	6.00
Irrigation water charge (about 2 acre-feet)	15.00
Taxes (orchard and equipment)	20.00
Tree replacement, new trees and miscellaneous material	5.00
Windbreak maintenance (10 percent of land area)	10.00
Total annual depreciation of equipment, buildings, etc.	15.00
Overhead (including supervision, miscellaneous administration, but not interest on net investment) 2/	10.00
Picking (300 field boxes)	60.00
Hauling (300 field boxes)	9.00
Total cost per acre	256.00
Returns, at $2.08 per packed box	364.00
Difference, available for interest on investment, orchard management, and marketing costs not already eliminated from item "returns"	108.00

1/ These calculations are considered reasonably representative of actual production, under present conditions in San Fernando Valley.

2/ May be considered to include, in part, some interest charges on current operating capital outlay; also miscellaneous charges incidental to administration.

Table 16. -- A standard of costs of walnut production in San Fernando Valley, Calif., based on an annual yield of 1,000 pounds of orchard-run walnuts per acre.

Material and Operation or Charge	Cost
	Dollars
Pruning	1.50
Brush disposal	.93
Planting cover crop	.30
Dusting or spraying	.35
Disease control and surgery	.15
Cultivation and furrowing	6.90
Irrigating 3 or 4 times	3.60
Miscellaneous cultural labor	.25
Tower work knocking, etc.; picking; hauling out, hulling and dehydrating; hauling to packing house	2.25
Irrigation water 16 inches at 7.62 per acre-foot	10.00
Cover crop seed	1.00
Dust or spray material	.35
Fuel and power for hulling and dehydrating	1.75
Miscellaneous materials	.50
Total material and labor	50.08
General expense (5 percent of above total)	2.50
Taxes on orchard and equipment	18.00
Repairs to machinery and equipment	1.00
Insurance (compensation and fire)	.75
Total cash overhead cost	22.25
Total cash costs	72.33
Returns, at 8¢ per lb.	80.00
Difference, available for interest on investment, orchard management, and any marketing costs not already eliminated from item "returns"	7.67

Table 17. -- A standard of costs of alfalfa production in San Fernando Valley, Calif., based on an annual yield of 6 tons per acre.

Material and Operation or Charge	Cost
	Dollars
Tillage, renovating, etc.; border and ditch work; irrigation; and miscellaneous cultural labor	7.00
Cutting, raking, shocking	7.00
Total labor cost 1/	14.00
Irrigation water charge (about 2 acre-feet)	15.00
Other materials	1.00
Taxes	14.00
Total cash costs	47.25
Depreciation	5.50
Total cost (not including interest on investment)	52.75
Returns, at $10 per ton	60.00
Difference, available for interest on investment, management, and any marketing costs not already eliminated from item "returns"	7.25

1/ Not including baling, which is not universal practice at present. Baling costs average $2 to $2.25 a ton.

Table 18. -- A standard of costs of lima bean production in San Fernando Valley, Calif., based on an annual yield of 1,600 pounds per acre.

Material and Operation or Charge	Cost
	Dollars
Plowing and other preplanting tillage	8.00
Fertilizing	.90
Planting	1.00
Crop cultivation	1.00
Hoeing	.90
Irrigation labor (2 times)	2.25
Miscellaneous cultural labor	1.80
Cutting, piling, threshing and hauling	8.50
Irrigation water charge (1.07 ac.-ft. per acre at $7.62)	8.15
Fertilizer (400 lbs. commercial or 4 tons manure)	8.00
Seed	4.00
Sacks and twine	1.50
Miscellaneous materials	.50
Taxes	14.00
Other overhead costs	3.50
Total cash costs	64.00
Depreciation of machinery and equipment	2.50
Total cost (not including interest on investment)	66.50
Returns, at $4.75 per 100 lbs.	76.00
Difference, available for interest on investment, management, and any marketing costs not already eliminated from item "returns"	9.50

Table 19. — A standard of costs of tomato production in San Fernando Valley, Calif., based on an annual yield of 8 tons per acre.

Material and Operation or Charge	Cost
	Dollars
Plowing and other pre-tillage	5.20
Planting and watering	3.45
Irrigating 3 to 5 times	3.60
Cultivating and furrowing	5.95
Hoeing	1.20
Pest control and miscellaneous cultural labor	2.45
Picking and hauling	33.40
Irrigation water charge (15 inches at $7.62 per acre-foot)	9.52
Plants (1400 at $3.50 per 1000)	4.90
Pest control and miscellaneous materials	6.00
Total labor and material costs	75.67
General expense (5 percent of above total)	3.78
Taxes	14.00
Machinery repairs	1.00
Compensation insurance	.75
Total cash costs	95.20
Depreciation of machinery and equipment	2.50
Total cost (not including interest on investment)	97.70
Returns, at $13 per ton	104.00
Difference, available for interest on investment, management, and any marketing costs not already eliminated from "returns"	6.30

ingly. Hence the two costs -- water and taxes -- are not drastically lower for alfalfa than for citrus, and whereas they comprise less than one-fifth of the total cash costs of producing oranges, they are more than three-fifths the total cash costs of producing alfalfa.

When compared with costs of producing alfalfa in principal competing areas (i.e., San Joaquin and Imperial Valleys), the two items also show San Fernando Valley at a disadvantage, offsetting the good yields obtained locally with little water. This appears in comparing the costs listed in Table 17 with those shown in Table 20, where for San Joaquin Valley, water at $5 and taxes at $2.50 1/ an acre together comprise only slightly more than one-fourth the total cash costs (of raising 5 tons of loose hay), while for Imperial Valley the combined water and cash overhead costs (including taxes) are only slightly more than one-third the total cash costs (of raising 5 tons of loose hay). Total cash costs per ton in San Joaquin Valley thus appear as $5.70; in Imperial Valley, $5.80; in San Fernando Valley, $7.875.

Los Angeles provides a major market for all three areas, so constituting a substantial advantage for San Fernando Valley by reason of the fact that most of the crop is consumed in the valley or nearby.

This advantage more than offsets the margin between its cash costs of production and those of the other two areas, as transportation of baled hay takes $3.40 per ton in the case of San Joaquin Valley and $3.70 per ton from Imperial Valley. Table 21 shows the group commodity

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1/ Not shown separately from other items comprising "Cash overhead Costs" in Table 20, but listed at this figure by Professor Shultis in another table.

Table 20. -- Standards of costs of alfalfa production under different conditions and with different yields. 1/

Item	San Joaquin and Sacramento Valleys				Antelope Valley	Riverside and San Bernardino Counties			Imperial Valley	
	Loose Hay			Baled Hay	Baled Hay	Baled Hay	Loose Hay		Loose Hay	Baled Hay
	Irrig. Dist.		Pump P.							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Yield, tons per acre	5	6	6	6	6	6	6	7	5	5
Assumed cuttings	6	6	6	6	6	6	6	7	6	6
Cultural labor cost per acre	$3.00	$3.00	$5.80	$5.80	$7.00	$6.00	$6.00	$7.00	$2.00	$2.00
Cutting, raking, shocking	7.00	7.40	7.40	7.40	7.00	7.00	7.40	8.50	6.50	6.50
Baling or stacking	7.50	8.00	8.00	10.00	9.00	10.00	8.00	9.00	7.50	10.00
Total labor cost	17.50	18.40	21.20	23.20	23.00	23.00	21.40	24.50	16.00	18.50
Water cost per acre	5.00	6.00	9.00	9.00	20.00	18.00	18.00	20.00	4.00	4.00
Other material costs	.75	1.00	1.00	3.00	3.00	3.00	1.00	1.00	1.00	3.00
Cash overhead costs (including taxes)	5.25	5.50	5.76	6.00	5.00	7.25	7.00	7.50	3.00	3.50
Total cash costs	28.50	30.90	36.96	41.20	51.00	51.25	47.40	53.00	24.00	29.00
Depreciation	7.10	7.10	9.10	9.50	12.00	10.00	10.00	10.20	5.00	5.20
Total cash and depreciation	35.60	38.00	46.06	50.70	63.00	61.25	57.40	63.20	29.00	34.20
Interest on investment	8.85	10.85	11.85	12.00	7.50	15.00	14.00	14.50	5.90	6.00
Total cost per acre	44.45	48.85	57.91	62.70	70.50	76.25	71.40	77.70	34.90	40.20
Cash costs per ton	5.70	5.15	6.16	6.87	8.50	8.54	7.90	7.57	4.80	5.80
Cash and depreciation costs per ton	7.12	6.33	7.68	8.45	10.50	10.21	9.57	9.03	5.80	6.84
Total all costs per ton	8.89	8.14	9.65	10.45	11.75	12.71	11.90	11.10	6.98	8.04

1/ After Table 31, "Standards of Production, Labor, Material and other Costs for Selected Crop and Livestock Enterprises" by Arthur Shultis, Extension Specialist in Farm Management. Mimeographed publication of College of Agriculture, University of California, Jan. 1938.
Column (1) - San Joaquin Valley; (2) - Sacramento Valley; (6) - Riverside County; (7) - San Bernardino County.

rates adopted by the Railroad Commission of the State July 3, 1938 and currently applying to hay shipped from various areas to the Los Angeles-Hynes territory.

Table 21. -- Group commodity rates from various territories to Los Angeles-Hynes territory, per 100 lbs.

Originating Territory	Rate to Los Angeles-Hynes Territory	
	Any quantity	Minimum Weight 20,000 pounds
	Cents	Cents
Coachella Valley	39	15
Salton Sea	43	17
Imperial Valley	47	18½
Lancaster	34	12
Bakersfield	41	17

However, the apparent advantage in favor of San Fernando Valley established by the transportation costs listed above disappears if interest on investment or land valuations be taken into account. Thus the total cost of producing loose hay in San Joaquin Valley on this basis is $8.89 per ton (Table 20); in Imperial Valley it is $6.98 per ton; but giving 6-ton alfalfa land in San Fernando Valley the locally low valuation of $400 an acre, capitalizing it at 5 percent, and adding the depreciation cost shown in Table 17, brings the total practically to the level appearing for San Joaquin Valley in Table 20, plus transportation. The same course of calculation leaves Imperial

Valley with a substantial advantage ($1.44 a ton) [1]. That this competition is effective is evident from the fact that the San Fernando alfalfa area does not grow much beyond the point of absorption of its crop by immediately local demand, while a heavy tonnage enters the Los Angeles markets from both San Joaquin and Imperial Valleys. The office of the Imerial County Farm Advisor estimates that 200,000 tons of hay leave that area annually for Los Angeles. The Kern County Farm Advisor reports that

> We have very few trucking companies located in this area, and to my knowledge there are no trucking companies in this area that transport alfalfa to Los Angeles. Most of the trucking outfits are operated with headquarters in Los Angeles. Some of them are known as the fly-by-night or gypsy type of trucker. Many of them buy the hay at the ranches in this area and take it to Los Angeles and bale it on what they call a back haul. It is generally understood, however, that the haul from Kern County to Los Angeles is approximately $3.00 per ton.

As a generalization not having reference to specific crops, it may be said that water costs in San Fernando Valley compare favorably with charges which have to be met in other sections of southern California. This statement is borne out by the following items extracted from reports made by the Bureau of Agricultural Engineering some years ago. While the figures and supporting exhibits in the Appendix (Appendix Tables L to O) are not strictly up to date, the comparisons they afford are believed to be generally indicative of present circumstances. [2]

1/ The cost of baling is omitted from these calculations on the assumption that it is about the same in the three localities. Baling is not the universal practice in San Fernando Valley for obvious reasons.

2/ For details refer to State of California, Dept. of Public Works, Bul. No. 8, "Cost of Water to Irrigators in California", by Harry F. Blaney, and Bul. No. 36, "Cost of Irrigation Water in California", by Harry F. Blaney and Martin R. Huberty.

Annual dollar cost per acre and per acre-foot, of irrigation water in southern California, including interest on capital invested in the water-system.

	Minimum per acre	Maximum per acre	Minimum per ac-ft	Maximum per ac-ft	Minimum per acre	Maximum per acre	Minimum per ac-ft	Maximum per ac-ft
	Year 1922				Year 1929			
Public Utilities								
Citrus trees	7.56	32.67	5.04	25.14	5.44	72.14	3.63	34.35
Deciduous	7.56	25.14	5.04	25.14	5.44	26.14	5.04	26.14
Alfalfa	5.54	25.14	1.35	25.14	6.96	17.98	5.04	10.08
All gravity system	5.54	25.14	1.35	25.14	5.00	26.14	3.63	26.14
All pumping system	15.85	32.67	12.10	21.78	8.59	72.14	8.40	34.35
Mutual Companies								
Citrus trees	2.07	60.07	1.22	50.91	5.06	84.33	2.73	41.27
Deciduous	2.07	41.28	1.22	27.67	5.06	58.52	2.73	38.25
Alfalfa	5.60	41.28	1.71	16.82	4.77	35.13	2.39	31.45
All gravity system	2.07	33.14	1.22	29.21	4.77	49.05	2.39	35.04
All pumping system	6.49	60.07	10.73	50.91	5.32	84.33	2.73	41.27
Irrigation Districts								
Citrus trees	7.97	21.00	2.66	8.90	4.60	46.58	1.19	116.45
Deciduous	4.04	21.00	2.66	22.19	4.60	36.97	1.19	35.75
Alfalfa	7.57	21.00	2.66	8.90	4.60	32.83	1.19	16.93
All gravity system	4.04	7.97	2.66	3.04	4.60	36.97	1.19	32.20
All pumping system	16.20	21.00	8.35	10.80	8.63	83.90	1.95	116.45

Farm Tenure

It is estimated that about three-fourths of the farms in San Fernando Valley are operated by their owners; the remainder by tenants, most of whom pay cash rent. To a marked degree the rented areas are truck farms -- a fact which should be recognized when considering Tables 18 and 19, although it is true that both lima beans and tomatoes are closely tied to alfalfa by reason of rotation factors. Annual cash rentals in the territory generally east of Van Nuys range from merely nominal figures to around $30 an acre; westward, they are, say, $20, $25 or $30. On the whole, they appear to have little close connection with current valuations on the lands involved, and to an appreciable extent there is a willingness on the part of some owners to recognize an advantage merely in having their land in tilth, rather than idle.

Crop rentals on bean land are on the basis of 1/4 to 1/3 of the crop, some tomato land is rented on the same arrangement.

CHARGES FOR AND REVENUE FROM SALES OF WATER

As will be detailed in the later discussion of Use of Water, the current season has witnessed a lower use of water for intermittent irrigation than has been recorded for 10 years; but the revenue obtained by the City from all water sales in the valley (domestic, combination and intermittent irrigation) has apparently reached its all-time peak.

The following monthly charges for water delivered within the City were those current at the time this report was written:

Domestic, Commercial and Industrial Service:

First 10,000 cu. ft., 15.5 cents per 100 cu. ft.; next 40,000 cu. ft., 13.1 cents per 100 cu. ft.; next 50,000 cu. ft., 10.7 cents per 100 cu. ft.; next 200,000 cu. ft., 8.3 cents per 100 cu. ft.; in excess of 300,000 cu. ft., 7.5 cents per 100 cu. ft.

Minimum monthly charges are made within the City in accordance with the following schedule:

5/8, 3/4 and 1 inch meter, $1.19; 1½ inch, $1.79; 2 inch, $2.38; 3 inch, $3.57; 4 inch, $4.76; 6 inch, $7.14; 8 inch, $9.52; 10 inch, $11.19. Other minimum charges are provided for service through a battery of water meters set on a service connection.

Combination Irrigation and Domestic Service:

Size of Service	Minimum Charge	Amount of Water
3/4 inch	$2.00	1,300 cu. ft.
1 inch	2.00	1,300 cu. ft.
1½ inch	2.90	1,900 cu. ft.
2 inch	2.90	1,900 cu. ft.
3 inch	3.55	2,300 cu. ft.
4 inch	4.80	3,100 cu. ft.

All in excess at 4.7 cents per hundred cubic feet for gravity system.
All in excess at 6.7 cents per hundred cubic feet for pump system.

This type of service can be either gravity flow or pump water system and can only be supplied to individual consumers who have not less than one-half acre of ground, planted to trees and crops which are grown primarily for commercial purposes.

Intermittent Irrigation Service:

1.75 cents per 100 cubic feet for gravity flow water ($7.62 per Ac.-ft.)
Minimum charge is $2.00 for each time water is turned on. Charges are collected in advance from renters, but farm owners operating large acreages have until the 15th of the month following service for settlement of bills.

This type of service applies only to water furnished by gravity or pump water system for irrigating agricultural, horticultural or floricultural crops produced primarily for the market, and is subject to the demands of domestic and commercial consumers and to rotation of service among intermittent irrigation users.

Intermittent irrigation service is not supplied in conjunction with combined irrigation and domestic service upon tracts of land aggregating less than five acres.

Table 22 shows the contribution each type of service in San Fernando Valley has made to the revenues collected by the City from sales of water, for each of the last 4 years.

Table 22. -- Annual revenue from water sales in San Fernando Valley and amount received from each class of service, 1935 to 1938. 1/

Fiscal Year 2/	Revenue from Sales			
	Domestic	Combination	Irrigation	Total
	Dollars	Dollars	Dollars	Dollars
1935	315,546	143,416	359,125	918,087
1936	467,904	170,310	489,735	1,127,950
1937	523,560	186,269	454,213	1,164,042
1938	611,547	212,249	454,133	1,277,929

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.
2/ Ending June 30.

The only change in rate during the period covered by Table 22 took effect January 1, 1938, when the irrigation charge was increased from $6.53 to $7.62 per acre-foot, the combination rate from 4 cents to 4½ cents per 100 cubic feet, and the domestic rate from 13 cents to 15½ cents per 100 cubic feet. During the fiscal year 1937-1938 approximately 69 percent of the total consumption was in the last 6 months of 1937 and under the old rate. The $6.53 irrigation rate was in effect

from 1933 to 1937; between 1930 and 1933 it was $7.84. The 13 cent domestic rate was in effect from 1930 to 1937.

A half rate for irrigation water was in effect during January 1918, March, April and May of 1919, March, April and May of 1920, and March and April of 1921. It was put into effect again during February and March of 1936.

Under consideration by the Board of Water and Power Commissioners when this report was written, was a proposal to change the irrigation rate for 1939 so as to provide a graduated schedule ranging from a minimum of $.0075 per 100 cubic feet in January and February to a maximum of $.0150 in July and August. The argument for the change was that the general reduction and the low winter rates especially, would result in an increased use of water throughout the year. Heavier winter applications to cover crops and winter vegetables were expected to result. The proposal was under study but had not been sent to the Board for approval prior to being written into an ordinance.

USE OF WATER

While total consumption of water for all purposes has, at times, been heavier than has been the case recently, the use for domestic purposes is now higher than it has been during the previous history of the aqueduct. Conversely, 1938 deliveries for intermittent irrigation have constituted a low point (see Table 23) notwithstanding the fact already brought out in the discussion of Population Trends, and

Table 23.-- Mean Annual Consumption of Water from Los Angeles Aqueduct Supply in the San Fernando Valley, Calif., 1920 to 1938. 1/

Calendar Year	Water Consumption		
	Domestic	Irrigation	Total
	Second-feet	Second-feet	Second-feet
1920	5.0	106.0	111.0
21	5.0	104.0	109.0
22	5.0	100.2	105.2
23	5.2	118.0	123.2
24	6.1	78.0	84.1
25	8.1	77.0	85.1
26	10.7	89.1	99.8
27	12.0	77.8	89.8
28	13.5	106.0	119.5
29	18.7	123.0	141.7
1930	17.6	107.7	125.3
31	15.0	105.0	120.0
32	13.0	85.0	98.0
33	13.5	87.0	100.5
34	11.4	88.0	99.4
35	15.0	87.0	102.0
36	24.9	110.0	134.9
37	27.4	96.0	123.4
38	29.1	81.7	110.8

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

detailed in Table 24, that the number of irrigation meters has not changed significantly for many years and that up to this year, at least, the acreage irrigated had not fallen off substantially.

Crop yields in San Fernando Valley, as universally where irrigation is the basis of agriculture, are, of course, governed somewhat by the amounts of water made available to the plants; and here, as elsewhere, the cost of water has its influence upon irrigation usage. Valley irrigators are skilful in taking maximum advantage of the rainfall, despite its vagaries; they also are cautious about overuse which, many think, might be detrimental to some crops because of the mineral content of the water.

Table 25 shows the monthly and annual use of aqueduct water for irrigation in the valley for the 10 years prior to the current one, serving to emphasize the heavy proportion of this use which is usually concentrated in the months of May, June, July, August and September. Before construction of the system of storage now operative this summer overload caused some trouble. The use of water for irrigation was curtailed in August and September of 1923, and a shortage during 1924 and 1925 made it necessary to warn irrigators to use it sparingly. This resulted in a light demand during those years. No difficulty has been experienced in recent seasons in meeting all irrigation demands.

An extreme economy in the use of water by crops served under the "intermittent irrigation" schedule is apparent from Table 26, which shows, for example, that even if the entire winter precipitation of 1936-7 be considered to have been available for use by crops, the additional amount received by irrigation provided the "net" acreage with only 3.39 acre-feet of water per acre -- a low figure but one substantially higher than any other corresponding total appearing in the record. This economy is even more apparent in the statistics

Table 24. -- Water meters in service in San Fernando Valley, Calif. 1/

Fiscal Year 2/	Domestic	Irrigation						
	1" and smaller	1½"	2"	3"	4"	6"	8"	Total
1917	1200	-	-	193	608	48	-	849
1920	2828	4	226	723	1560	152	-	2665
1924	7800	8	325	962	1893	211	-	3399
1930	14717	5	319	976	1931	212	2	3445
1931	15166	4	326	979	1937	213	2	3461
1932	15400	8	286	1001	1864	212	2	3373
1933	15844	10	287	997	1859	209	2	3364
1934	16183	14	319	1013	1861	209	2	3418
1935	17013	17	344	1036	1879	210	2	3488
1936	18888	27	354	1073	1896	214	2	3566
1937	21662	25	362	1100	1911	211	2	3611
1938	23985	26	342	1103	1908	212	2	3593

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

2/ Ending June 30.

Table 25.-- Monthly and annual use of Los Angeles Aqueduct water for irrigation in San Fernando Valley, California, for the years 1928-9 to 1936-7. 1/

Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.
1927-28	15621	11931	6962	4490	357	615	1107	690	861	8509	10578	9877	71598
1928-29	16790	13530	8092	4736	1845	615	1107	167	1661	3154	10763	11365	73825
1929-30	20295	18081	8806	6335	4939	3321	1292	666	308	4046	5043	10829	83961
1930-31	19250	17097	9877	5351	3868	923	492	111	1845	8747	3875	10056	81492
1931-32	18450	14760	9699	5535	2559	62	123	58	1230	4939	6396	9282	73093
1932-33	9840	11193	8925	4428	4463	1169	431	278	1722	4582	6950	7914	61895
1933-34	11624	12485	7438	5166	3749	861	246	500	1169	5891	9717	7200	66046
1934-35	13530	11931	8211	4244	1666	185	62	333	246	536	4736	10294	55974
1935-36	14637	14145	8925	5105	2380	2153	1845	633	4059	1785	9102	12614	77383
1936-37	17466	13776	9342	4490	3868	1661	62	56	246	1785	6950	9937	69639
Average	15750	13892	8627	4988	2969	1156	676	349	1334	4397	7411	9936	71490

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

Table 26.-- Use of Rainfall and Irrigation Water by Crops in San Fernando Valley, Calif., by years and seasons, 1925 to 1937. 1/

Year	Precipitation: Year	Irrigation Use, Per Acre: Net	Irrigation Use, Per Acre: Rotated	Rainfall: Calendar Year		Rainfall: Season	
		Ac.-ft.	Ac.-ft.	Inches	Ac.-ft.	Inches	Ac.-ft.
1925	24-25	1.08	0.90	11.21	0.94	9.43	.79
1926	25-26	1.29	1.02	19.37	1.61	19.00	1.58
1927	26-27	1.27	1.06	19.26	1.60	18.72	1.56
1928	27-28	1.52	1.29	9.68	0.81	11.26	.94
1929	28-29	1.67	1.45	7.38	0.62	10.93	.91
1930	29-30	1.57	1.36	14.05	1.17	12.12	1.01
1931	30-31	1.57	1.40	21.59	1.80	14.62	1.22
1932	31-32	1.40	1.29	11.60	0.97	19.58	1.63
1933	32-33	1.43	1.32	15.88	1.32	12.12	1.01
1934	33-34	1.42	1.29	16.17	1.35	13.01	1.08
1935	34-35	1.39	1.29	12.51	1.04	18.69	1.56
1936	35-36	1.67	1.55	18.25	1.52	12.03	1.00
1937	36-37	1.50	1.42	17.59	1.47	22.72	1.89

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

relating to use of irrigation water by the principal irrigated crops of the valley, shown in Table 27, the weighted average irrigation deliveries to the "rotated" acreage being only 1.37 acre-feet per acre.

Distinctly encouraging to such economy are the exceptionally efficient means and methods of delivering water and the accuracy of its measurement. Although San Fernando Valley farmers are required to give three days notice of their need for water and order specific amounts, they get the water at the times specified and apply it where wanted, with a minimum of waste. They are fortunate in this respect, as they escape the inconveniences characteristic, say, of the rotation method of delivery, under which water often is not available when most needed at specific places, must be taken when it is available or lost completely, and sometimes comes in heads which are difficult and expensive to handle. The demand system, as operative in the valley, removes the temptation often felt under the rotation system, to use excessive quantities of water when it is at hand; instead, only such quantities are used as the farmer thinks are needed and no more, for he has to pay for all he orders.

It is true that the yields of certain important crops are lower in San Fernando Valley than in some other sections of the State 1/

1/ For instance, statistics representing production for the entire State, compiled by the California Citrus League, show citrus averages substantially higher than those shown in Tables 12 and 13, as follows. (The figures are for packed boxes per acre. Those appearing in Tables 12 and 13 are for field boxes. Conversion rates used elsewhere in this report are 1.4 packed boxes of oranges equal 1 field box, and 1.7 packed boxes of lemons equal 1 field box):

Year	Valencias	Navels	Lemons
1931	214.5	236.3	202.0
1932	208.3	223.4	173.8
1933	202.6	227.6	175.6
1934	160.6	187.3	203.5
1935	243.1	263.0	236.8
1936	157.0	208.0	194.3
Average	237.2	269.1	257.2

Table 27.-- Use of irrigation water per acre, by principal irrigated crops in San Fernando Valley, California, by years, 1930 to 1937 1/

Year	Average net use, rotated acreage	Alfalfa	Asparagus	Beans	Sugar Beets	Citrus Trees	Deciduous Trees	Fig Trees	Grapes	Olive Trees	Roses and Bulbs	Walnut Trees	Miscellaneous Truck
	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.
1930	1.36	1.92	2.23	1.20	---	1.96	.57	.99	.49	.89	1.92	.77	1.32
1931	1.40	1.67	2.47	1.16	.89	2.05	.57	1.13	.47	1.96	1.94	.88	1.33
1932	1.29	1.65	2.22	.92	.80	1.72	.59	1.03	.39	1.00	1.87	.75	1.27
1933	1.32	1.85	1.83	1.09	1.00	1.70	.53	1.16	.49	.83	2.27	.80	1.30
1934	1.29	1.90	1.78	.90	1.06	1.65	.45	1.09	.59	.60	2.37	.75	1.34
1935	1.29	1.76	1.62	.93	1.08	1.59	.47	.98	.43	.49	1.91	.78	1.35
1936	1.55	2.15	1.71	1.10	1.55	1.99	.58	1.06	.52	.92	2.20	1.07	1.54
1937	1.42	1.97	1.52	.98	.84	1.79	.59	1.13	.59	.56	2.06	.93	1.52
Weighted average	1.37	1.87	1.85	1.07	1.08	1.80	.55	1.07	.50	.94	2.07	.84	1.37

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

partly for climatic and environmental reasons about which nothing can be done. 1/ Nevertheless, for such crops as alfalfa the record indicates an irrigation use so economical as to allow explanation of reported good yields only on the score that the crop is established in exceptionally fertile and moisture-retentive soils under which the water-table is so located as to benefit somewhat from the subsurface contributions of neighboring areas, and considering the obvious circumstance that it takes full advantage of the seasonal distribution of the rainfall. Precipitation is, in fact, so concentrated in the winter months and those of early spring that it is not unusual for one alfalfa cutting (or even two) to be made before any irrigations at all are applied.

Table 28 emphasizes this point in the case of the citrus crops also, illustrating the prevalent willingness of many growers to delay irrigation until the spring season is well advanced. Although (as has already been shown) cost of water is not the important item in the case of citrus production that it is for, say, alfalfa, it apparently has more than a little to do with the irrigation program of even this industry, as is indicated by the sharply increased use in March, 1936, when an off-season "half-rate" charge was in effect.

The whole record of actual water use suggests the desirability of experiment and investigation to determine whether more liberal

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1/ Again with citrus as an example, the "interior" location of the valley imposes upon it certain climatic characteristics apparently operating generally to restrict yields. See "A Survey of Orchard Practices in the Citrus Industry of Southern California", by Roland S. Vaile, Bul. 374, University of Calif., 1924.

Table 28. -- Water delivered to citrus groves in San Fernando Valley by intermittent irrigation service of Owens River Aqueduct water 1/.

Month	1933			1934			1935			1936			1937			Average per month		
	Area	Water Use per Acre	Total Water Delivery	Area	Water Use per Acre	Total Water Delivery	Area	Water Use per Acre	Total Water Delivery	Area	Water Use per Acre	Total Water Delivery	Area	Water Use per Acre	Total Water Delivery	Area	Water Use per Acre	Total Water delivery
	Acres	Ac.Ft.	Ac.Ft.	Acres	Ac.Ft.	Ac.Ft.	Acres	Ac.Ft.	Ac.Ft.	Acres	Ac.Ft.	Ac.Ft.	Acres	Ac.Ft.	Ac.Ft.	Acres	Ac.Ft.	Ac.Ft.
Jan.	750	.20	148	20	.09	2	14	.18	2	2606	.27	599	37	.24	9	685.4	.20-	152.0
Feb.	182	.16	27	300	.15	43	23	.14	3	1670	.21	348	82	.15	12	451.4	.16+	86.6
Mar.	1107	.25	281	418	.18	76	64	.17	11	1664	.29	472	15	.13	2	653.6	.20+	168.4
April	5089	.26	1315	6594	.25	1663	176	.15	26	429	.20	84	407	.17	70	2539.0	.20+	631.6
May	4908	.28	1349	8183	.31	2528	1992	.25	505	7159	.31	2264	6823	.29	2006	5813.0	.28+	1730.4
June	6937	.34	2322	5705	.30	1686	8028	.34	2749	8478	.35	2996	8196	.35	2841	7468.8	.33+	2518.8
July	7690	.37	2820	8164	.34	2829	8505	.37	3096	9324	.39	3625	9391	.41	3808	8614.8	.37+	3235.6
Aug.	7552	.38	2815	7935	.38	3050	9070	.38	3425	8700	.38	3264	8495	.36	3094	8350.4	.37+	3129.6
Sept.	6214	.33	2067	6938	.34	2413	7097	.33	2338	8262	.36	2987	8673	.35	3055	7436.8	.34+	2572.0
Oct.	6366	.31	1941	6333	.31	1978	6871	.31	2086	6214	.32	2013	7413	.29	2165	6639.4	.30+	2036.6
Nov.	5490	.27	1492	2298	.23	531	4873	.25	1248	5428	.30	1631	6429	.26	1660	4903.6	.26+	1312.4
Dec.	2492	.25	626	82	.11	10	4163	.22	931	3977	.24	936	2738	.21	567	2690.4	.20+	614.0

1/ After records furnished by D. A. Lane, in charge of Ground Water Surveys and Development of the Los Angeles City Bureau of Water Works and Supply.

use would result in generally increased yields and consequent returns exceeding the presumably increased costs.

Quality of the Water

All water entering the City's distribution system is protected by a complete laboratory service including bacteriological, sanitary, and mineral tests. When necessary, the water supply is disinfected by infinitesimal quantities of liquid chlorine controlled by automatic machines. These are regulated in turn by "photo-electric eyes" to prevent any overtreatment which otherwise might give rise to noticeable doctoring of the water.

From 100 to 110 bacteriological samples, in addition to nearly 100 samples for other tests, are collected for daily analyses to insure good and safe water, meeting the United States Treasury Department Standards which are the highest requirements set for drinking water throughout the United States.

Tastes and odors occurring in the water are generally due to natural conditions in the storage reservoirs. Every week ninety-five samples of reservoir water are taken to check its quality for taste and odor control. These samples are subjected to the following rigid laboratory tests: Forty are given microscopic examination; 40, sanitary chemical analysis; 15, mineral content test. In addition, over 200 samples are tested weekly at the reservoirs.

But for one troublesome constituent (boron) the mineral content tests would disclose an excellent quality of water from the standpoint

of irrigation requirements. Table 29 shows the weighted average of the analyses for the fiscal year 1937-8, indicating total alkalinity of only 127 parts per million, with chlorides 22 parts. Not shown, however, is the boron content which, though small, is sufficient to affect the usefulness of the water for certain important crops, lemons being acutely sensitive to boron, walnuts not infrequently [1] showing injury from its presence, and oranges doing so occasionally. Whether justified or not, a more or less general concern over the boron menace to crops is probably responsible to an appreciable extent for the extreme economy of irrigation usage for some crops.

Table 30 shows the tolerance of various plants to boron, as determined by experiments at Rubidoux Laboratory (Riverside) and reported by Dr. Frank M. Eaton, Physiologist, United States Bureau of Plant Industry [2]. In each group the plants first named are considered as being most sensitive and the last named most tolerant.

Table 31 is the summary of analyses of boron in the aqueduct supply for the period 1928 to 1937 made at Rubidoux Laboratory (Riverside).

The source of the boron carried by the aqueduct water is definitely known. In the Hot Creek basin of Long Valley numerous springs discharge into tributaries of Owens River. Their contributions

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1/ If boron effects appear prior to September in walnut orchards, the fixation in the soil is probably strong and detrimental to the crop; if the appearance is later, the threat is considered not so serious.

2/ See "Boron in Soils and Irrigation Waters and its Effects on Plants", Technical Bulletin No. 448, United States Department of Agriculture, Feb. 1935. (Table 1, page 9)

Table 29. -- Chemical analyses of Los Angeles water.
(Weighted average for fiscal year 1937-38)

Item	Aqueduct Supply	Los Angeles River Galleries
Specific electrical conductance	41.0	70.6
pH	8.1	7.5
Alkalinity as $CaCO_3$	127. p.p.m. 1/	190. p.p.m. 1/
Chlorides	22. "	29. "
Sulphates	52. "	134. "
Sodium	46. "	49. "
Calcium	29. "	74. "
Magnesium	9. "	21. "
Iron	0.10 "	0.11 "
Silica	16. "	22. "
Total hardness as $CaCO_3$	109. "	273. "
Total hardness as $CaCO_3$	6.4 g.p.g. 2/	16.0 g.p.g. 2/

1/ Parts per million.

2/ ~~Drams~~ Grains per gallon.

Table 30. -- Tolerance of various cultivated plants to boron.

Sensitive	Semitolerant	Tolerant
Lemon	Lima bean	Carrot
Grapefruit	Sweet potato	Lettuce
Avocado	Bell pepper	Cabbage
Orange	Tomato	Turnip
Thornless blackberry	Pumpkin	Onion
Apricot	Zinnia	Broad bean
Peach	Oat	Gladiolus
Cherry	Milo	Alfalfa
Persimmon	Corn	Garden beet
Kadota fig	Wheat	Mangel
Grape (Sultanina and Malaga)	Barley	Sugar beet
Apple	Olive	Palm (Phoenix Canariensis)
Pear	Ragged Robin rose	Date palm (Phoenix dactylifera)
Plum	Field pea	Asparagus
American elm	Radish	Athel (Tamarix aphylla)
Navy bean	Sweet pea	
Jerusalem artichoke	Pima cotton	
Persian (English) walnut	Acala cotton	
Black walnut	Potato	
Pecan	Sunflower (native)	

Table 31. -- Boron content of the Los Angeles Aqueduct At San Fernando Power House and at the Heading near Aberdeen, Calif. A Summary.

Year	San Fernando		Heading
	Annual Mean	April-Sept. Mean	Annual Mean
	p.p.m.	p.p.m.	p.p.m.
1928 1/	0.71		0.70
1929	0.69	0.73	0.75
1930	0.57	0.56	0.49
1931	0.55	0.58	0.60
1932	0.85	1.02	0.98
1933	0.79	0.90	1.12
1934	0.86	0.94	0.93
1935	0.71	0.78	0.76
1936	0.63	0.69	0.78
1937	0.64	2/	0.84

1/ August to December, inclusive.

2/ April, 0.62; May, 0.98; June, 0.92; July, 0.60; August, 0.47; September, 0.42.

(NOTE: The means for the year 1937 appearing in Table 31 represent a range of 0.42 p.p.m. to 0.98 p.p.m. at San Fernando Power House, and 0.40 p.p.m. to 1.83 p.p.m. at Aberdeen Heading. The present effort of the Bureau of Water Works and Supply is to keep the boron proportion in the water entering San Fernando Valley distributaries at a figure no higher than 0.50 p.p.m. during the irrigation season. Since June 1934 the monthly mean has not gone above 1 p.p.m.)

carry high percentages of this mineral, and some of this boron-laden water finally reaches San Fernando Valley. Plans have been drawn to provide diversion works, dikes and spreading grounds to permit a control of the boron content of the Hot Creek area water more effective than the present method of diluting these contributions with purer water from other sources. This would be done by storing the boron-laden waters during the spring run-off period and later spreading them to prevent their reaching and mixing with the aqueduct supply, which would be retained in Long Valley reservoir. The cost of the necessary construction has been estimated as $200,000. This amount has been included in an application for a total allotment involving various projects which is now awaiting consideration by the Federal Public Works Administration.

The boron problem is not confined entirely to the water supply, being importantly complicated by the quantities in the soil, both fixed and in solution. In fact, the proportion of boron in the soil solution is higher than in the water. However, an interview with Dr. Eaton early in October 1938, leads the writer to conclude generally that the present conditions with respect to boron are the best that have existed in the valley for several years, probably because of the leaching effects of the heavy rains of the last two winters, coupled with the success of the Bureau of Water Works and Supply in reducing the boron proportions in the water delivered to irrigators.

One intended effect of the proposed revision of rates to be charged for intermittent irrigation water would be an increased use

in the off-season months, when the rates would be substantially lower than those charged in mid-summer. This increased use would, it is claimed, permit an expansion of the winter-truck business and the more general utilization of cover crops. It is probable that a heavier use of water, especially in the periods when the boron content of the water is low, would be desirable for the sake of leaching effects; however, such leaching might involve the loss of nitrogen as well as boron, and might necessitate heavier fertilization to replace nitrogen than otherwise would be required. This replacement could be effected by growing cover crops, applying commercial fertilizers, or by both methods; if by the former, additional use of water presumably would be called for, although late fall and winter seasons would be principally involved. It is the stated belief of the valley branch of the Los Angeles County Farm Bureau that the increased use of water induced by off-season reduced rates and for the purposes referred to above, would substantially (if not, in fact, completely) offset the curtailment of revenues which otherwise would follow.

Effect of Unit Size upon Use

Interesting but not to be stressed unduly because they represent only one year when rainfall was exceptional, are the segregations appearing in Appendix tables A to K with reference to water use by different crops according to size-of-unit groupings. So far as they may be considered significant at all, they appear to show generally a superior economy for the larger farms.

In the case of alfalfa, this is more importantly true than appears from the group averages, since by far the greater portion of the total acreage of this crop is in the largest size-group. A similar circumstance typefies the citrus crops, where the difference in favor of the largest size-group is even more evident. Again in the case of beans and tomatoes a relatively low unit use is apparent where the farms are largest.

Of the large-area crops, only walnuts appear to receive the heavier irrigation on the more extensive farms. As in the case of each of the other crops just mentioned, the greater portion of the walnut acreage is in the group of 20-acres or more, though a heavy proportion of the total number of groves is in the smaller size-groups; but both the group average and the apparent actual use by the trees in the largest units are higher than in the smaller farms. A possible explanation of this apparent anomaly is that the process of subdivision has brought about the transfer of many walnut trees from what might be considered expert care, to care relatively inexperienced, not concerned with profitable operations and perhaps not acquainted with water requirements of trees from the standpoint of fruit production.

LAND VALUES AND TAXATION BASES

No statistics of recent enough date to be reliably indicative of present land values are available, but certain Federal Census data suggest the severe revision of peak values which has taken place in the last eight years. These figures have to do first with the

values of farm land, buildings and machinery reported in 1930 for Los Angeles judicial township.

As of April 1, 1930 the Census showed an average value for land alone in the Los Angeles township farms, of $1158 per acre. All farm buildings (including dwellings) were valued at $137 per acre. Dwellings were valued at $2433 per farm, and farm implements and machinery at $733 per farm.

The 1935 Federal Census of Agriculture did not report statistics by judicial townships, but a comparison of the figures for values of farm land and buildings (combined) in Los Angeles County shows a reduction of approximately 53 percent. If it be assumed that this reduction applied to San Fernando Valley farms, and to land and buildings alike, the January 1, 1935 average value of the land in valley farms was $544 an acre (by the Census system), and the value of land and buildings was $609 per acre. Considering these figures to involve only farmed units of 3 acres or more apiece, they appear to be not out of line with actuality. Since 1935 there has been some strengthening of values accompanying the resumption of real estate development already referred to in the discussion of population status and trends, so that an average 1938 valuation per acre, corresponding to the estimated 1935 value of $544 per acre, might be said to be around $600.

Even these much reduced values can not be justified solely on the basis of the returns from agriculture; they take into account the

exceptional advantages for comfortable living offered to valley residents whether or not they be farmers. Likewise they reflect undoubtedly the expectation, long and widely held, that the valley eventually will be grown over by the outward-pushing city.

Local taxation takes all these elements into account. Assessed valuations on agricultural land alone range from about $150 per acre to $350 or $400, an average being perhaps $250 or $300 -- closely in line, that is, with the Census figures just analyzed, since assessed valuations are supposedly 50 percent of actual values. Higher assessed valuations are imposed, it is true, on lands in or near the more populous centers, or where subdivision activities are in progress or in early prospect. Citrus trees (over 5 years old) are given assessed valuations of from $100 to $150 per acre. Because of the various troubles affecting the walnut industry, walnut acreage is assessed at around $250 an acre and the trees at $10. Valuations of deciduous fruit trees are nominal. Alfalfa and truck areas are assessed within the general $150-to-$350 range.

Despite the current activity of real estate sub-dividers and other salesmen, few purchases of land are being made for purely agricultural use. The scenic and climatic features of the valley have lately led many actors and other professional men to buy attractively located acreages, which if not already in orchards or other farm use, they have developed into the semblance of country estates with some sort of cropping a part of the routine. At the other extreme, the subdivision developments have involved the cutting of fairly large

units into parcels running from large town lots to those of a few acres apiece which serve the dual purposes of small home sites and either part-time gardening or poultry or rabbit ranching. In neither case is a type of farming involved which can throw any dependable light upon the future prosperity and probable extent of the valley's agriculture.

Some control of the development of the heavily populated North Hollywood-Van Nuys section has been made by extension to it of the standard residential, commercial and manufacturing or industrial zoning regulations. The areas so zoned are shown on Figure 14. The provisions involved in the ordinance now operative are as follows:

Provisions of "New Zoning Ordinance"

Residential Zones.

Zone "R1". -- Permits one single family dwelling per lot with the usual accessories such as private garages, raising of chickens and rabbits and doctor's, dentist's or minister's office. If lot contains over 10,000 sq. ft. there may be one dwelling on each 5,000 sq. ft.

Zone "R2". -- Permits one or more single family, double or duplex dwellings or a multiple dwelling provided not more than four families are housed on the lot, together with the usual accessories. Lots over 10,000 sq. ft. in area may have four families for each 5,000 sq. ft. The buildings, exclusive of the garages and accessories, may not cover more than 60% of an inside lot and 70% of a corner lot nor be more than 2 1/2 stories or 35 feet in height.

Zone "R3". -- Permits any "R2" use, also multiple dwellings, apartment houses, fraternity and sorority houses, churches and schools provided the buildings are not over 4 stores or 50 feet in height and do not cover more than 60% of an inside lot or 70% of a corner lot. One story garages and accessories are not limited to the 60% and 70% coverage.

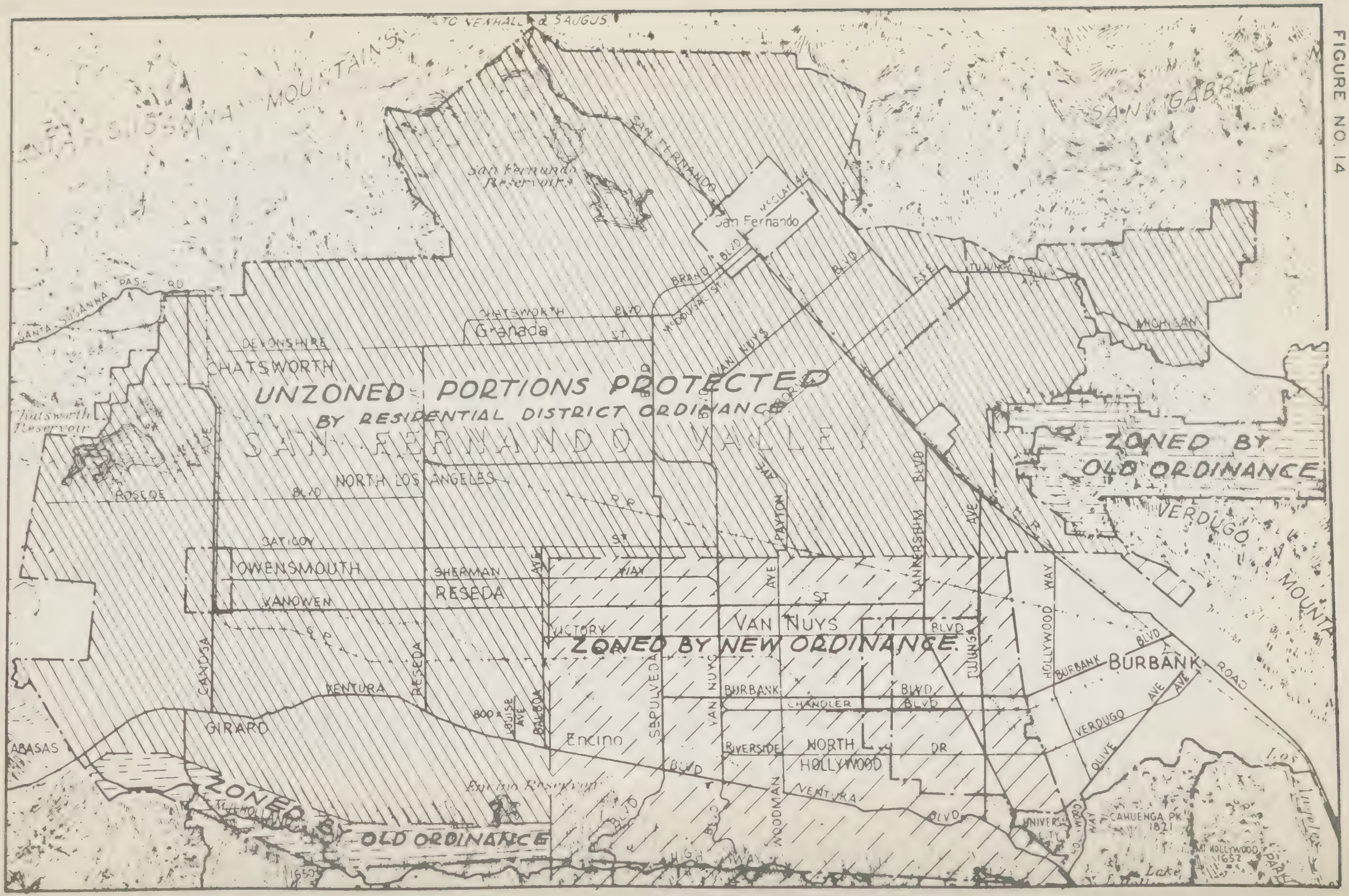


FIGURE NO. 14

AREA IN SAN FERNANDO VALLEY AFFECTED BY RESIDENTIAL, COMMERCIAL, MANUFACTURING, AND INDUSTRIAL ZONING REGULATIONS 1938

Zone "R4". -- Permits "R3" uses, also height limit apartment houses, hotels and clubs and public dining rooms in hotels if entrance is from the lobby.

Commercial Zones.

Zone "C2". -- Permits any Residential use and all types of retail business, offices, theatres, hospitals, and automobile service stations and storage garages if no heavy repairing is done in connection therewith.

Zone "C3". -- Permits any Residential and "C2" use, also wholesale business, repair garages, tinsmith, carpenter, plumbing and upholstering shops, newspaper and printing establishments, and similar commercial enterprises, and in addition permits a small percentage of the floor spaces to be used for light manufacturing incidental to permitted uses.

Manufacturing or Industrial Zones.

Zone "M2". -- Permits any type of Residential, Commercial or industrial use except certain specified industrial uses which are obnoxious or detrimental due to the emission of odor, dust, smoke or noise.

Zone "M3". -- Permits any lawful use and is usually called "Heavy Industrial Zone."

Note: Any existing use which is at variance with the provisions of the zone established on the property is called a "non-conforming use" and is permitted to remain undisturbed and may be altered or repaired up to 50% of the assessed value.

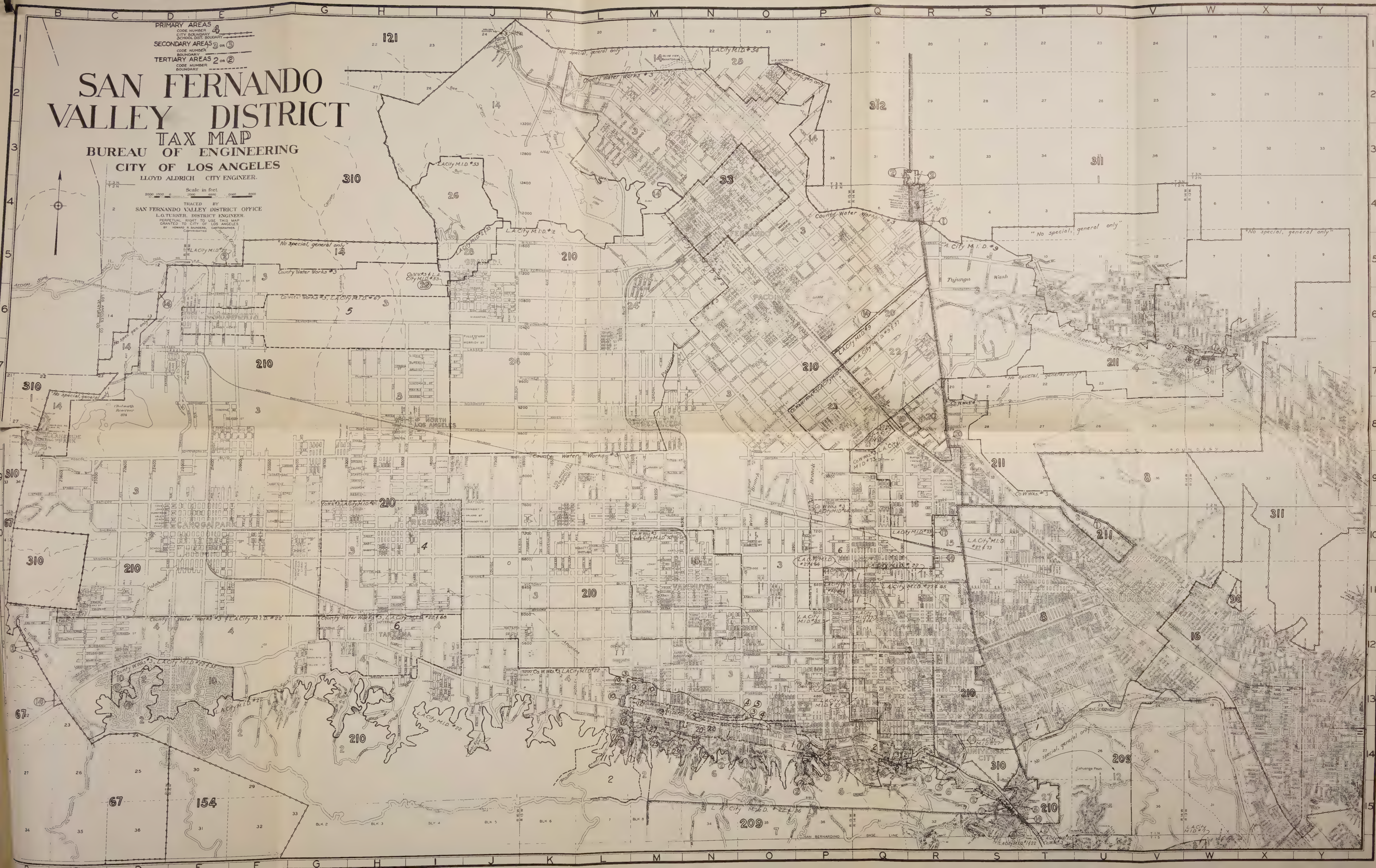
Some resentment has been expressed by valley residents over the operation of the zoning regulations upon property still used only or mainly for agriculture. Such property may be interior lots in tracts with developed or prospectively developing frontages, or it may be front lots vacant but facing or adjacent to built-up properties. The assessor's office insists that no unreasonable increase in tax valuations is enforced in either case, but agitation among the owner elements

is outspoken to the effect that anticipation of improvements upon lands so located should not be precipitate, and that valuations for purposes of taxation should be kept low as long as the land is in merely agricultural use.

In the tables and discussions having to do with costs of producing crops, the important item of taxes has already had some attention, but since each example took into account only the assessments against the land and equipment (including trees) the actual amount of the tax burden did not appear. The effort there was to indicate only the costs actually chargeable to the type of agriculture specifically under consideration.

While such a limitation is proper in an analysis concerned primarily with the future of agriculture, it is perhaps not wholly convincing if taken to indicate the actual tax obligation of rural residents of the valley. In order to complete the study it was therefore considered necessary to investigate the whole subject of taxation somewhat intensively, and to do this the services of the Right of Way and Land Division of the Department of Water and Power were requested. A detailed study, involving large-area samples in typical sections of the valley, was thereupon made by Mr. E. F. Rybolt and Mr. U. M. Jones, under the direction of Mr. Clarence S. Hill, Right of Way and Land Agent. The results of the examination are set out in a document separate from this report. Therein are presented, in exhaustive detail, the facts regarding the current assessed valuation, tax rate, and tax burden, per acre, of 27 selected areas which together comprise

FIGURE NO. 15


SAN FERNANDO VALLEY DISTRICT
TAX MAP
BUREAU OF ENGINEERING
CITY OF LOS ANGELES
LLOYD ALDRICH CITY ENGINEER.
Scale in feet
TRACED BY
SAN FERNANDO VALLEY DISTRICT OFFICE
L.O. TURNER, DISTRICT ENGINEER.
PRIMARY AREAS 4
CODE NUMBER
CITY BOUNDARY
SCHOOL DIST. BOUNDARY
SECONDARY AREAS 3 or ③
CODE NUMBER
BOUNDARY
TERTIARY AREAS 2 or ②
CODE NUMBER
BOUNDARY
SAN FERNANDO
PACOIMA
NORTH LOS ANGELES
CANOGA PARK
RESEDA
VAN NUYS
TARZANA
BURBANK
GLENDALE
UNIVERSAL CITY
Tujunga Wash
County Water Works #3
"No special, general only"
SAN BERNARDINO BASE LINE

a large portion of the valley. Also shown in detail are present facts regarding community bond indebtedness, delinquencies, and the debt retirement program. 1/

The Introduction to the report of the Right of Way and Land Division is reproduced below:

San Fernando Valley - Taxation

The area covered by this report is that part of the San Fernando Valley annexed to the City of Los Angeles in 1915. All of the area involved in this report is subject to the County tax of Los Angeles County, the City of Los Angeles, the Los Angeles Elementary School System, the Los Angeles High School System, the Los Angeles Junior College, the County Flood Control District, and the Metropolitan Water District.

In addition to the tax burden applying equally to all the area, there are numerous taxing units, as hereinafter enumerated, which apply to certain sections of the main area. In many instances the special taxing units overlap.

Attention is called to the fact that because of the various plans, or methods, of taxation, no hard and fast rule can be applied, and this must be taken into consideration in determining the rate of taxation, or the general burden of taxation, of any particular section, or of the pro-rata amount as applied to any particular section.

The Tax Levy - How Applied

For General County Purposes, all taxable property is subject to taxation.

For Acquisition and Improvement Districts, all lands within each District, except lands belonging to the United States Government, or to the State of California, are subject to taxation.

1/ Figure 15 shows all minor civil divisions in San Fernando Valley having taxing power; the statistics here quoted apply only to the area north of Ventura Boulevard and principally west of San Fernando Road, where the present agricultural development is most important.

For Drainage Improvement Districts, land only is subject to taxation for interest and sinking fund requirements; but all taxable property is liable for maintenance requirements.

For Flood Control Districts, all taxable real property within the District is subject to taxation.

For Public Library Purposes, all taxable property except that within Library Districts and incorporated cities which maintain free Public Libraries, is subject to taxation.

For Park, Recreation and Parkway Districts, all taxable property within the District is subject to taxation.

For Road Improvement Districts, land only within the District is subject to taxation.

For Sanitation Districts, all taxable real property within the District is subject to taxation.

For Road Districts, all taxable property outside of incorporated cities is subject to taxation.

For Water Districts and for Waterworks Districts, all taxable property within the District is liable to taxation.

For School Purposes, all property is subject to taxation.

Public Utilities

In arriving at a basis, or a weighted factor, the taxation of public utilities must be taken into consideration. All property belonging to public utilities is subject to what might be termed the general tax, but some property belonging to public utilities is not subject to the special district tax.

Many of the special districts ..... enumerated make the levy on land only; in some instances taxes for interest and sinking fund requirements are levied on the land only; and the tax maintenance requirements are levied on all property within the district.

Assessed Valuations Los Angeles County

Total Assessed Valuation ..... $2,521,010,900.

Included in the above is the sum of $247,513,090.00, assessed by the State Board of Equalization, and being what is known as Public Utility property.

To be added to the above total is the sum of $426,698,735.00, known and designated as solvent credits. This class of property bears only a small burden of taxation, there being a different rate and method of taxing solvent credits.

Assessed Valuations Los Angeles City

Total Assessed Valuation ..... $1,362,464,440.

To be added to the above total is the sum of $332,081,235.00, known as solvent credits.

Assessed Valuations Los Angeles School Districts

Total Assessed Valuation ..... $1,615,268,460.

Assessed Valuations Los Angeles Metropolitan Water District

Total Assessed Valuation ..... $1,896,966,255.

This amount is exclusive of approximately $50,000,000. of assessed valuation in Orange County.

Particular attention should be given to the Metropolitan Water District. The outstanding bonded indebtedness of this District at the present time is $155,880,000. The authorized issue is $220,000,000. The tax rate of $0.40 on the $100 of assessed valuation at the present time is for interest requirements. Commencing in 1940 provision will have to be made for the retirement of bonds, to which must be added the cost of maintenance and operation.

Assessed Valuations Los Angeles County Flood Control District

Total Assessed Valuation ..... $2,148,071,400.

Assessed Valuations

The assessed valuations of the various districts as given above are of course included in the total assessed value of Los Angeles County.

General Tax Burden

The tax burden of any area is determined by and made up of interest and sinking fund requirements of bond issues, plus the cost of operation of the various governmental units.

The general bonded indebtedness applied to all of the property covered by this report is as follows:

A. The bonded indebtedness of Los Angeles County as of December 31, 1937, was $4,700,000.00.

B. The bonded indebtedness of the City of Los Angeles as of December 31, 1937 was $230,857,962.84.

C. The bonded indebtedness of the Los Angeles County Flood Control District as of December 31, 1937, was $33,619,718.87.

D. The bonded indebtedness of the Metropolitan Water District as of December 31, 1937 was $137,368,000.00 (at present approximately $160,000,000.00).

E. The bonded indebtedness of the Los Angeles Elementary School District as of December 31, 1937, was $37,571,760.80.

F. The bonded indebtedness of the Los Angeles City High School District as of December 31, 1937, was $31,564,375.72.

G. The bonded indebtedness of the Los Angeles Junior College as of December 31, 1937, was $342,000.00.

The general tax burden of all of the property covered by this report for the fiscal year 1938-1939 is $5.4333 per $100 of assessed valuation, to which must be added the taxes for the special districts ..... enumerated.

The following comparative statement of outstanding bonds, taken from the report of the County Auditor to the Board of Supervisors of Los Angeles County as of December 31, 1937,

shows the general trend of the bond situation in Los Angeles County and the various municipal subdivisions thereof.

Not all of these bonds apply to the property covered in this report.

The statement is as follows:

Comparative Statement of Bonds Outstanding

	Dec.31, 1935	Dec.31, 1936	Dec.31, 1937
General County.....	$5,603,000.00	$5,150,000.00	$4,700,000.00
Acquisition and Improvement Districts.....	5,334,071.23	4,993,964.83	4,564,787.11
Drainage Improvement Dist.	4,285,098.33	3,891,533.60	.....
Flood Control District...	23,961,250.00	31,511,500.00	33,819,718.87
Library District (Palos Verdes).....	76,000.00	75,000.00	72,000.00
Road Improvement Dist....	1,016,218.52	761,560.29	306,916.07
Sanitation Districts	7,352,530.00	7,166,960.00	6,980,390.00
Water Districts-County...	1,133,000.00	1,105,000.00	1,072,000.00
Water District-Metropolitan	59,536,000.00	100,000,000.00	137,368,000.00
Water Works Districts ...	385,669.76	391,433.78	419,197.80
Elementary School Dist...	55,883,070.00	60,885,970.00	58,538,420.00
High School Districts ...	44,659,000.00	49,332,000.00	47,466,000.00
Junior College Districts.	80,000.00	621,000.00	590,000.00
Unified School Districts.	.....	.....	375,000.00
Los Angeles City	166,413,687.84	190,761,625.34	230,857,962.84
All other Cities	64,144,412.15	62,114,486.73	59,520,511.24
Total Bonds Outstanding..	$439,863,007.83	$518,762,034.57	$586,650,903.93

Special Tax Districts

The assessed valuation is ..... shown for each taxing unit mentioned in this report, and in each instance the valuation given as the assessed valuation, is the value of the property subject to the ad valorem tax for that District. The general tax might be levied on additional property and for that reason no fixed amount can be given as the assessed valuation of the area under consideration or of any special taxing unit.

In some instances all of the common property in a District is subject to the tax; in others, only the land;

and in some of the Districts a considerable amount of property known as Public Utility Property is not subject to the tax.

The special taxing units, or districts, are ..... enumerated by separate parcel numbers. Each parcel, representing a taxing unit, or a combination of overlapping taxing units, is made up of the assessed valuation and acreage of varying amounts of property. The tax burden as given in each parcel is the average tax burden of the acreage comprising the parcel.

Table 32 is a compilation prepared by the author of this report, from the detailed statistics which follow the above-quoted introduction to the report of the Right of Way and Land Division. It omits figures regarding bond obligations, which are sufficiently summarized in the quoted Introduction.

The report of the Right of Way and Land Division concludes with the following summarizing statement:

This report covers an area north of Ventura Boulevard, and principally west of San Fernando Road, embracing properties located in Townships 1, 2 and 3 North, and Ranges 15, 16 and 17 West, respectively. The principal area is located in Townships 2 North and Ranges 15 and 16 West.

Estimated number of acres in entire area, exclusive of town property	60,000
Number of acres tabulated in this report	30,983
Estimated assessed value in entire area, exclusive of town property, but including solvent credits and public utilities	$30,000,000.
Total assessed value of property tabulated in this report	9,306,328.

Table 32. -- Assessed valuation, tax rate and tax burden, per acre, of selected areas in San Fernando Valley, Calif., 1938.

Tract Number	Location	Map (Fig. 15) Reference	Area Involved	Average Assessed Valuation per acre	Average 1938 tax rate per $100	Average Tax Burden per acre
			Acres	Dollars	Dollars	Dollars
1	E and NE of San Fernando	O and N; 1 and 2	264	194.00	12.7433	24.71
2	E of San Fernando	N, O and P; 2, 3 and 4	710	221.00	5.7033	12.60
3	W of San Fernando	K, L and M; 5 and 6	2670	349.00	5.8133	20.28
4	N of Granada	I; 5 and 6	168	455.50	8.6533	39.42
5	E of Chatsworth	F, G and I; 6 and 7	1813	248.00	5.7033	14.12
6	Chatsworth vicinity	D, E, F and G; 6, 7 and 8	3699	206.93	5.7033	11.80
7	S of Owensmouth (Canoga Park)	D, E, F; 12	1040	234.40	5.8933	13.81
8	N and W of Canoga Park	C, D and E; 9 and 10	1924	225.00	5.7033	12.83
9	S of Canoga Park	D, E and F; 11	1092	226.67	5.7033	12.93
10	Reseda vicinity	G, H and I; 9, 10 and 11	1139	389.00	6.2833	24.45
11	Reseda vicinity	G, H, I, J and K; 8, 9, 10 and 11	3024	382.20	5.7033	21.80
11A	N of Reseda	J; 6, 7, 8 and 9	2860	271.95	5.8133	15.81
12	W and SW of Van Nuys	K, L and M; 9, 10, 11 and 12	2064	263.00	5.7033	15.00
13	SW of Van Nuys	K and L; 12 and 13	383	741.50	5.8933	43.70
14	Van Nuys vicinity	M, N and O; 10, 11 and 12	678	865.80	5.7733	49.99
15	Between Van Nuys and North Hollywood	O and P; 12	391	692.33	5.7033	39.49
15A	NE of Van Nuys	O and P; 9, 10, 11 and 12	967	307.54	5.7033	17.54
16	Bet. Van Nuys and N.Hollywood	P; 12	73	622.00	5.6433	35.10
17	N of N. Hollywood	Q; 11 and 12	204.5	286.50	5.9733	17.11
18	Bet. V. Nuys and N. Hollywood	P; 11	56	161.88	8.9333	14.46
19	Bet. V. Nuys and N. Hollywood	Q; 11	71	347.70	9.0533	31.48
20	Bet. V. Nuys and N. Hollywood	Q; 11	78	164.50	9.2633	15.24
21	SW of Roscoe	P; 10 and 11	541	224.40	8.9933	20.18
22	W of Roscoe	Q and R; 9 and 10	575	309.00	6.7033	20.71
23	NW of Roscoe	P and Q; 7 and 8	569	213.27	6.4133	13.68
24	NW of Roscoe	Q; 6, 7 and 8	278.5	101.80	6.1733	6.28
25	W of Roscoe	M, N, O, P and Q; 6, 7, 8, 9 & 10	3651	272.31	5.7033	15.53

Average assessed value per acre of property tabulated	$300.37
Average tax burden per acre, general tax only, exclusive of special taxing districts	16.32
Estimated average tax burden per acre, including special taxing districts...	18.50

All assessed values include improvements, if any. The report deals only with taxes levied on an ad valorem basis. It does not include special assessments.

Thus the average assessed value per acre may be taken as very close to $300 and the range is from a little more than $100 to about $865. The average annual tax burden, per acre, is $18.50, representing a range from $6.28 to $49.99.

FARM INDEBTEDNESS

Items making up the tabulations appearing in the chapter on "Costs of Crop Production" do not include estimates of interest on investment in land and improvements nor indication of the annual obligation involved in farm mortgages. This omission is intentional, for two main reasons.

In the first place (ignoring other elements than agricultural productiveness which enter into current valuations of San Fernando Valley farms), "the principle adhered to by most economists is that interest on land and investments sunk in the land, such as for original leveling and drainage, is not properly a cost of production" since "land is not reproducable ..... The value of land arises from the amount it will produce over and above the cost of operating it, including depreciation on the improvements which have been made on it for the

purpose of increasing its natural productivity" 1/.

This is not to say, of course, that interest on land does not need to be considered in such a study as the one here reported; it certainly is a matter of concern to farmers who have mortgaged their land and have to pay interest on the borrowed money. For that reason each of the cost-of-production tables concludes with an indication of the amount of money presumably available, after other costs have been met, for various allowances including interest, whether or not it be on borrowed money.

More to the point is the fact that, in the time and with the facilities at his disposal, the author has not been able to ascertain conclusively the present extent of mortgage indebtedness of the valley farms.

The Federal Census of 1930 showed that approximately 55 percent of those farms in Los Angeles County which were operated by their owners, were mortgaged. For the mortgaged farms operated by "full" (as distinguished from "part") owners, the ratio of mortgage debt to value was 25.9. Farms "operated by full owners owning no other farm land" and reporting both mortgage debt and charges, showed a ratio of debt to value of 25.56, and a ratio of charges (interest, etc.) to debt of 7.06.

These proportions and ratios may not, of course, have had identical application to other than owner-operator farms throughout

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1/ See "Value and Cost of Water for Irrigation in Coastal Plains of Southern California, 1933" by Frank Adams and Martin R. Huberty. Bul. No. 43, Division of Water Resources, California State Department of Public Works, p. 24.

the County, nor to San Fernando Valley farms specifically, but they may be taken as generally indicative of the mortgage situation in 1930; probably they represented the valley farms with reasonable approximation. If so, it may be concluded that in 1930 slightly more than half the valley farms were mortgaged for about one-fourth the value of their land and buildings; and that the interest rate averaged about 7 percent.

The situation now is probably better than in 1930 as regards the total indebtedness against the land, if the assumption is justified that the changes known to have occurred throughout the Nation have correspondingly involved the San Fernando Valley. 1/ Foreclosures and distress transfers took place there as elsewhere; some of the recent subdivision activities have involved farms acquired by banks and other loaning agencies by these processes, and a good many of the properties now on the market are in this status. They, of course, were doubtless mortgaged in 1930 but are not now. Refundings of old

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1/ "Since the World War American agriculture has borne a heavy debt, much of it contracted on the basis of inflated prices. There was not much change in the total during the 1920's. Mortgage indebtedness rose from 1920 to 1928, but short-term and intermediate-term debt declined. After 1929 farm mortgage indebtedness dropped too -- largely through foreclosures and distress transfers. It fell from $9,214,278,000 in 1930 to $7,645,091,000 in 1935 and to $7,254,821,000 in 1937. This decline, though necessary to the future strength of agriculture, was a painful process to thousands of farmers. Personal and collateral loans to farmers declined also. At the end of 1936 they totaled only $593,614,000, as compared with nearly $4,000,000,000 at the end of 1920." -- Report of the Secretary of Agriculture, 1938; p. 69.

mortgages by agencies of the Federal government and perhaps, in some cases, by other establishments, have contributed further to lighten the load.

It is questionable, however, whether the reduction in total debt has corresponded to the reductions in valuations which have occurred since 1930, and relatively the burden may be as substantial as it was then, if not more so. As far as individual farm owners are concerned it is therefore probable that at least one in every two has somehow to meet an annual interest obligation on an amount of borrowed money equivalent to somewhat more than one-fourth the present value of his land; and he may still have to pay a fairly high rate of interest although, on the average, probably not the 7 percent which was current in 1930. For most debtor farmers this necessity, whether or not it represents an item proper for inclusion in a list of costs of production, must be met with the returns from their agricultural processes; it is inescapable if ownership be retained; and by many it can not be provided comfortably under the present handicaps of agriculture, as is evident from the cost tabulations themselves.

The following statement of Federal Land Bank and Land Bank Commissioner loans is indicative of the extent to which government agencies have been active in readjusting the farm mortgage situation in the valley since 1933.

Federal Land Bank Loans

Prior to 1933: Land Bank made 92 loans. Amount of investment, $375,800. Sixty-one of these loans had been paid off, in the amount of $231,300.

Subsequent to 1933: Total loans, 90. Amount of investment, $685,200. Eight of the loans have been paid off in the amount of $40,900.

Commissioner's Loans

Since 1933: Total loans, 197. Amount of investment, $651,000. Nineteen of the loans have been paid off in the amount of $59,200.

CONCLUSIONS

Costs of producing the typical crops of San Fernando Valley are high compared with costs in competing areas of southern California. This is especially the case as regards alfalfa. It is true also of citrus crops, not because expenses are higher than those prevalent in other citrus-producing areas of southern California, but because average yields are lower and therefore less profitable than those obtained in many competing sections.

Tax rates are based upon property valuations which take into account other elements besides returns from agriculture. The valley is a part of the city of Los Angeles, and as such enjoys to a degree not found elsewhere for so extensive a farming area, the protection, conveniences and comforts of urban living. Valuations should continue to take these factors into account, even though agriculture remain the principal use to which the land is put.

Moreover, land valuations recognize the advance of residential subdivision and the possibility that the rural aspect of much of the valley area will presently give way to one more characteristically urban. So far as valuations are based on this expectation, or on the strictly urban elements already existent in the farming area, they should not be expected to be supported wholly by returns from agriculture. In other words, all the benefits of which tax rates are a reflection should not be lost sight of in considering the position of tax costs in the total costs of producing crops.

An effort to justify a zoning plan for the areas not now zoned,

with the purpose of protecting agriculture from encroachments of residential, commercial and industrial development, raises several questions of practicability. The police powers of the city by which it may impose zoning restrictions are broad; legally, a zoning plan established with a purpose essentially opposite to the plan now applying to the southeastern portion of the valley (i.e., to protect agriculture from commercial, industrial and residential development) might perhaps be put into effect. If it were applied and held to be legal, it might succeed in perpetuating the present agricultural use of the portions of the valley involved in its operation, but in doing so it might also bring about the reduction of present land valuations, at least until general conditions might so change as to make it possible for agricultural returns to support them. Moreover, taxes would still have to be imposed at rates which would sustain and eventually pay for the city services and facilities already established, unless public policy should recommend a subsidizing reduction for the sake of continuing the existence of a large near-by agricultural area.

However, while the movement of population into the valley apparently still has momentum, it is by no means to be assumed that it will proceed indefinitely at its present or an accelerating rate. Many other portions of the city, enjoying comparable or superior advantages (in transportation, sewerage, etc.), have still to be built up. While Los Angeles perhaps has far to grow before reaching stationary size, the author of this report does not assume that San Fernando Valley is to be changed over residentially, commercially and industrially with an abruptness which would have to ignore the attractions of other portions of the city.

Los Angeles county and city taxing authorities presumably already recognize the handicaps of agriculture in the Valley; if they do not, it is hoped that the representations made in this report will so emphasize the circumstances that the tax burden on lands continuing in agriculture may be kept as low as possible without injustice to other portions of the city.

Water charges can not be declared generally exorbitant, and are, in fact, lower than in many other sections of southern California, although constituting an important item in the production costs of some leading crops. Water costs are not a controlling element in the cost of producing citrus fruits or walnuts but a reduction of rates might be desirable if it brought about an increased use of water — a possibility to be investigated by scientific as well as practical experimentation soon to get under way. For alfalfa, the water cost places valley farmers at a disadvantage with their competitors even if land valuations are not taken into account and the necessary place of alfalfa in certain crop rotations is ignored. In fact, but for its rotation advantages alfalfa growers apparently would fare better with other crops, unless their costs of production could be reduced. However, while the possibility of a downward adjustment of the irrigation rate is suggested by the recently increased revenue obtained by the city from the sales of water for domestic uses in the valley, the proposal that such a reduction be made must logically raise the question as to whether it can be done in fairness to domestic consumers throughout the city and without involving inequitably the financial necessities of the Metropolitan Water District and the rates it must charge for equivalent services. The author

believes that San Fernando Valley farmers should have such benefits as the city can afford to extend by way of cheap water, but he is not well enough informed regarding rates to be established by the Metropolitan Water District to say whether or not a retention or reduction of present aqueduct rates would constitute a subsidy unfair to other users under the Metropolitan District system.

A P P E N D I X

Table A.— Use of water by alfalfa in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/												Total number of all units	Total area of all units	Average quantity of water applied per acre
	0 to 3 acres			3 to 5 acres			5 to 10 acres			10 to 20 acres			20 acres and over					
	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre			
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	13	21.5	2.45										5	311.0	1.86	18	322.5	1.89
2	14	22.5	1.59	3	12.5	2.02	2	17.0	2.12	2	35.0	1.75	5	532.0	2.18	26	619.0	2.13
3	21	21.5	1.34	6	26.0	3.26							2	590.0	3.40	29	637.5	3.35
4	6	9.5	3.89	1	5.0	4.34	1	10.0	2.76	2	37.5	2.20	1	28.0	2.75	11	246.0	2.73
6	3	5.5	2.18	1	5.0	2.10	1	8.0	2.77							5	18.5	2.41
7	21	24.5	2.16	5	21.0	1.59	1	9.0	1.95	2	15.0	3.10	1	40.0	1.98	30	124.5	2.22
8	2	2.0	2.11	1	5.0	1.88										3	7.0	1.94
9	5	8.0	1.84	3	14.0	1.62							1	29.0	2.84	8	22.0	1.68
10	8	11.5	1.78	4	15.5	1.88	4	42.0	2.02				4	183.0	1.92	20	252.0	1.93
11	4	3.5	1.75				2	15.0	1.74	3	52.0	1.93	5	257.0	1.34	14	327.5	2.10
12	8	13.0	2.12	2	8.0	1.72	6	50.5	1.33	6	88.0	1.37	20	1262.0	1.64	42	1421.5	1.65
13	15	22.0	1.24	4	18.5	1.54	5	41.0	1.39	4	74.0	1.94	24	1383.5	1.61	52	1539.0	1.61
Weighted average			2.01			2.14			1.94			1.98			1.96			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table B. -- Use of water by asparagus in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/: 0 to 3 acres: Number of units	0 to 3 acres: Total area	0 to 3 acres: Water used per acre	3 to 5 acres: Number of units	3 to 5 acres: Total area	3 to 5 acres: Water used per acre	5 to 10 acres: Number of units	5 to 10 acres: Total area	5 to 10 acres: Water used per acre	10 to 20 acres: Number of units	10 to 20 acres: Total area	10 to 20 acres: Water used per acre	20 acres and over: Number of units	20 acres and over: Total area	20 acres and over: Water used per acre	Total number of all units	Total area of all units	Average quantity of water applied per acre
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	1	1.0	1.01										2	122.0	1.47	3	123.0	1.46
2	1	10.0	1.84	1	4.5	2.05										2	5.5	2.00
3										1	20.0	1.62				1	20.0	1.62
4										1	14.0	2.15				2	23.0	1.73
6				1	5.0	3.02										1	5.0	3.02
7	1	1.5	2.60				2	17.0	2.40	1	15.0	.71	5	179.0	1.62	9	212.5	1.59
8							1	7.0	.65	1	15.0	1.28	7	272.0	1.60	9	294.0	1.61
9													1	25.0	1.54	1	25.0	1.54
10																		
11													2	55.0	1.15	2	55.0	1.15
12													1	30.0	1.75	1	30.0	1.75
13										1	20.0	.99	1	28.0	1.93	2	48.0	1.54
Weighted average			1.86			2.56			1.90			1.34			1.62			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table C. -- Use of water by beans in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/												Total number of all units	Total area of all units	Average quantity of water applied per acre
	0 to 3 acres			3 to 5 acres			5 to 10 acres			10 to 20 acres			20 acres and over					
	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre			
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1				4	19.0	1.08	2	20.0	.92	1	15.0	1.05	19	2524.5	.38	26	2578.5	.41
2							1	10.0	1.00				3	123.0	.75	4	5.5	.77
3													1	25.0	.43	1	25.0	.43
4																		
6																		
7				1	5.0	1.54	3	25.0	1.09				5	169.0	.77	9	199.0	.83
8										1	20.0	1.10	3	230.0	.88	4	232.0	.98
9																		
10				3	15.0	.74	4	35.0	1.11	5	90.0	1.19	12	1282.0	.95	24	1422.0	.85
11				2	10.0	.98	2	16.0	1.45	3	44.5	1.16	18	1523.0	1.17	25	1593.5	1.18
12							2	15.0	1.32	7	123.0	1.28	11	592.0	.97	20	730.0	1.02
13	1	1.5	.45	2	9.5	.90	7	59.0	1.03	3	53.0	1.16	21	2047.5	1.02	34	2170.5	1.02
Weighted average			.45			.98			1.10			1.18			.86			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table D. -- Use of water by citrus in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/												Total number of all units	Total area of all units	Average quantity of water applied per acre
	0 to 3 acres			3 to 5 acres			5 to 10 acres			10 to 20 acres			20 acres and over					
	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre			
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	1	2.0	1.32													1	2.0	1.32
2a	5	13.0	1.34	8	36.5	1.70	5	37.5	1.32	2	31.0	1.39	1	67.0	1.48	21	185.0	1.29
2	11	24.0	1.49	12	54.0	1.80	12	85.5	1.24	5	69.0	.90	1	57.0	.98	40	289.5	1.08
3	4	9.0	1.91				1	7.5	1.26	1	15.0	1.94				6	31.5	1.76
4				1	5.0	.40				1	18.0	2.10				2	23.0	1.73
6	20	30.5	1.55	10	49.0	1.88	25	230.0	2.16	8	125.0	2.77	12	633.0	2.10	75	2408.5	.95
7	10	21.5	1.61	10	46.0	1.78	5	33.5	2.20	4	66.0	1.84	7	249.0	1.62	36	416.0	1.72
8	20	45.0	1.47	26	124.0	1.48	56	498.0	1.64	46	745.5	1.73	29	2121.5	1.80	177	3534.0	1.75
9a	19	42.0	1.72	26	122.5	2.15	21	163.5	2.12	9	157.0	1.78	11	369.0	2.05	86	849.0	2.00
9	21	45.5	1.95	25	118.5	2.22	20	173.5	1.95	12	203.5	1.97	9	281.0	2.49	87	822.0	2.10
10	6	11.0	.94	18	86.0	1.47	10	85.5	1.36	8	128.0	1.83	12	752.5	1.43	54	1063.0	1.46
11	9	19.0	1.76	10	45.0	2.20	19	183.5	2.38	10	178.0	1.72	26	2954.0	.70	74	3379.5	.87
12	4	7.0	1.48	2	10.0	1.10	7	63.0	1.46	8	125.0	1.36	9	753.0	1.57	31	958.0	1.77
13	1	1.0	.98	5	20.0	1.81	6	60.0	1.58	7	103.0	1.70	3	114.0	1.93	22	297.0	1.77
Weighted average			1.64			1.77			1.80			1.78			1.34			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table E. — Use of water by deciduous trees in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/: 0 to 3 acres: Number of units	0 to 3 acres: Total area	0 to 3 acres: Water used per acre	3 to 5 acres: Number of units	3 to 5 acres: Total area	3 to 5 acres: Water used per acre	5 to 10 acres: Number of units	5 to 10 acres: Total area	5 to 10 acres: Water used per acre	10 to 20 acres: Number of units	10 to 20 acres: Total area	10 to 20 acres: Water used per acre	20 acres and over: Number of units	20 acres and over: Total area	20 acres and over: Water used per acre	Total number of all units	Total area of all units	Average quantity of water applied per acre
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	13	28.0	.82	7	32.5	.60	2	18.0	.44				2	193.0	.17	24	271.5	.32
2	13	28.0	.89	11	50.5	.94	1	7.5	.25							24	126.0	1.01
3	6	12.0	.46	1	5.0	1.56	2	18.0	.74							9	35.0	.57
4	11	28.5	.66	2	9.0	.26	4	30.5	.67	2	34.5	.18	6	175.0	.38	23	277.5	.41
6	6	8.0	1.24	9	43.0	.83	2	14.0	.95	4	55.0	.83	1	26.0	1.55	22	146.0	.74
7	6	9.5	.63	2	10.0	.40	1	10.0	.37							9	29.5	.46
8	2	5.0	.84	2	10.0	.73										4	15.0	.67
9	7	17.5	.60	2	10.0	1.08	2	17.0	1.37	3	43.0	.60				21	87.5	.80
10	4	7.0	1.17	1	4.0	.34	2	15.5	.62							7	26.5	.73
11	15	31.5	.60	6	28.5	.49	4	33.0	.53	1	11.5	.65				26	104.5	.56
12	2	2.5	1.02				1	9.0	1.18	3	43.0	.75				6	54.5	.83
13	1	2.5	.53				2	23.5	.67	1	16.0	.75	1	26.0	.69	5	68.0	.81
Weighted average			.79			.74			.72			.75			.29			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table F. -- Use of water by flowers in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/												Total number of all units	Total area of all units	Average quantity of water applied per acre
	0 to 3 acres			3 to 5 acres			5 to 10 acres			10 to 20 acres			20 acres and over					
	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre			
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1				1	5.0	1.29	1	7.0	2.92							2	12.0	2.22
2	3	7.0	2.00	1	4.0	2.82	1	10.0	2.64							5	21.0	2.44
3				1	4.0	.33										1	4.0	.33
4																		
6	1	2.5	4.26				2	21.0	2.66	2	32.0	2.32	2	49.0	1.43	7	104.5	2.01
7							3	24.0	2.54	1	20.0	1.02				4	44.0	1.80
8	3	5.5	2.64				1	7.5	3.15	1	13.0	1.52	2	87.0	1.62	7	113.0	1.72
9	2	2.5	.69	3	15.0	2.18	9	72.5	1.52	3	52.0	2.26	2	56.0	2.60	20	218.0	2.35
10	1	5.0	2.00													1	5.0	2.00
11													1	16.0	1.37	1	16.0	1.37
12																		
13	1	3.0	1.30							3	55.0	1.88	1	60.0	2.40	4	118.0	2.14
Weighted average			2.13			1.82			2.41			2.05			1.84			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table G. -- Use of water by small fruit in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/												Total number of all units	Total area of all units	Average quantity of water applied per acre
	0 to 3 acres			3 to 5 acres			5 to 10 acres			10 to 20 acres			20 acres and over					
	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre			
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	9	14.5	2.26	2	9.0	3.42										11	23.5	2.70
2	7	8.0	1.71													7	8.0	1.71
3	8	10.5	1.92													8	10.5	1.92
4	4	4.5	2.54													4	4.5	2.54
6	3	4.0	2.96													3	4.0	2.96
7	3	6.0	2.82													3	6.0	2.82
8	2	2.0	.74													2	2.0	.74
9	4	5.0	2.54													4	5.0	2.54
10	2	3.5	1.59													2	3.5	1.59
11	1	1.0	1.76	1	5.0	.50										2	6.0	.69
12																		
13	1	2.0	2.19	2	7.5	3.62				1	12.0	2.38				4	21.5	2.79
Weighted average			2.13			2.85						2.38						

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table H. -- Use of water by tomatoes in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/												Total number of all units	Total area of all units	Average quantity of water applied per acre
	0 to 3 acres			3 to 5 acres			5 to 10 acres			10 to 20 acres			20 acres and over					
	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre			
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	7	14.5	1.50	5	23.0	1.44	11	95.0	1.43	5	79.0	1.15	5	200.0	1.13	33	411.5	1.24
2	8	14.5	1.25				4	33.0	1.64	1	17.0	2.78	2	90.0	1.65	15	154.5	1.73
3	5	11.0	1.12	3	12.5	1.25				1	17.0	2.19				9	40.5	1.62
4										1	15.0	2.32				1	15.0	2.32
6	8	17.5	1.29	7	30.5	1.73	6	48.5	1.76	7	117.0	1.61	3	78.0	1.26	31	291.5	1.55
7	6	9.0	1.46	5	22.0	1.53	3	26.0	1.38				1	65.0	.74	15	122.0	1.06
8	4	5.5	1.19	5	22.0	1.63	5	38.0	1.23	1	18.0	1.46	1	25.0	1.75	16	108.5	1.48
9	4	9.5	1.89	2	10.0	1.68	2	14.0	.94	2	40.0	1.81	2	63.0	1.39	12	136.5	1.52
10										1	12.0	.92	3	150.0	1.19	4	162.0	1.17
11	1	2.5	1.00	4	18.5	1.37	5	42.0	1.10	4	58.0	1.51	3	99.0	1.57	17	220.0	1.44
12	3	4.0	1.97	5	23.0	1.51	7	62.5	1.78	8	118.0	1.34	6	259.0	1.75	29	466.5	1.64
13	6	14.5	1.79	1	5.0	1.42	10	95.0	1.42	10	174.0	1.63	11	515.0	1.38	38	803.5	1.45
Weighted average			1.44			1.55			1.46			1.55			1.40			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table I. -- Use of water by Trees - Intercrop, in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/												Total number of all units	Total area of all units	Average quantity of water applied per acre
	0 to 3 acres			3 to 5 acres			5 to 10 acres			10 to 20 acres			20 acres and over					
	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre			
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	1	2.5	.84	5	25.0	1.40	4	30.0	1.30							10	57.5	1.32
2	2	5.5	1.73	6	26.5	1.44	2	16.0	.80							10	48.0	1.28
3	2	5.5	2.47	3	15.0	1.51	4	38.0	.89							9	58.5	1.20
4																		
6	3	8.5	2.32	1	5.0	1.88										4	13.0	2.28
7	9	16.5	2.33	9	41.5	1.29	5	50.0	.88	2	40.0	2.54				25	148.0	1.60
8	1	2.5	5.40	3	14.0	1.66	4	39.0	1.15	2	40.0	1.35	1	23.0	1.48	11	118.5	1.44
9							5	45.0	1.62	1	17.0	2.04				6	62.0	1.63
10	1	2.5	1.61	1	4.0	1.48	1	8.0	1.51	3	50.0	.95	3	110.0	1.00	8	174.5	1.03
11				4	20.0	1.89	6	58.0	1.47	2	40.0	.97				13	158.0	1.25
12				1	3.5	1.94	3	30.0	.93	2	26.0	.80				6	59.5	.93
13	1	2.5	.71				2	20.0	1.47				1	60.0	1.25	4	21.5	2.80
Weighted average			2.25			1.55			1.19			1.39			1.18			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table J. -- Use of Water by Truck in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/: 0 to 3 acres: Number of units	0 to 3 acres: Total area	0 to 3 acres: Water used per acre	3 to 5 acres: Number of units	3 to 5 acres: Total area	3 to 5 acres: Water used per acre	5 to 10 acres: Number of units	5 to 10 acres: Total area	5 to 10 acres: Water used per acre	10 to 20 acres: Number of units	10 to 20 acres: Total area	10 to 20 acres: Water used per acre	20 acres and over: Number of units	20 acres and over: Total area	20 acres and over: Water used per acre	Total number of all units	Total area of all units	Average quantity of water applied per acre
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	29	60.5	1.28	10	45.5	.78	9	70.0	1.39	5	81.0	1.17	10	505.5	1.40	63	762.5	1.35
2	14	23.0	.74	5	23.0	1.22	5	40.5	1.22	5	72.0	1.68	1	24.0	1.32	30	182.5	1.36
2a	14	30.5	1.47	10	44.5	.90	7	60.0	1.42	7	91.5	1.27	8	306.0	1.10	46	532.5	1.38
3	34	59.0	1.22	11	46.5	1.59	15	107.0	2.05	13	187.5	2.18	6	238.5	1.59	79	638.5	1.78
4	10	23.5	1.26	11	45.0	1.30	24	202.5	1.78	24	378.5	2.16	23	809.5	1.76	92	1459.0	1.94
6	13	23.0	1.05	9	41.5	1.55	17	195.5	1.28	11	155.5	1.77	9	319.5	1.50	59	737.0	1.49
7	19	28.0	1.16	13	57.0	1.21	20	153.5	1.75	15	231.0	1.79	19	897.5	1.62	86	1367.0	1.63
8	13	23.5	1.12	7	33.5	1.40	2	14.0	2.45	9	137.5	1.21	8	266.0	1.50	39	474.5	1.41
9	13	23.0	1.00	3	14.0	1.22	4	36.0	2.28	6	90.0	1.67	3	85.5	1.58	29	248.5	1.64
9a	3	8.5	.97	3	23.5	1.58	8	55.0	.95	7	100.5	1.15	5	162.0	1.01	28	349.5	1.10
10	6	9.5	1.23	3	21.5	.79	9	68.0	1.75	4	54.0	1.25	6	248.0	1.24	30	401.0	1.31
11	7	14.0	1.00	8	35.0	1.15	3	20.5	1.78	9	133.0	1.32				27	202.5	1.32
12	6	12.5	1.61	2	9.0	1.32	7	54.5	1.76	6	110.0	1.96	8	276.5	1.71	29	462.5	1.76
13	11	16.0	.85	5	22.0	1.19	9	71.0	1.40	11	154.0	1.46	2	44.0	1.18	38	307.0	1.35
Weighted average			1.14			1.26			1.76			1.74			1.62			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

Table K. -- Use of Water by Walnut Trees in San Fernando Valley, Calif., 1937, according to size of farmed units served by Los Angeles Aqueduct.

Water district	Size of farms or units 1/														Total number of all units	Total area of all units	Average quantity of water applied per acre
	0 to 3 acres			3 to 5 acres			5 to 10 acres			10 to 20 acres			20 acres and over				
	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre	Number of units	Total area	Water used per acre		
		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft		Acres	Ac-ft
1	18	30.5	.84	18	84.5	1.18	19	171.5	.70	7	95.5	.58	9	471.5	.75	71	853.5	.73
2	25	54.5	.79	23	107.5	.54	14	112.5	.56	5	79.5	.69	4	112.5	.50	71	466.5	.59
3	13	32.5	.83	10	47.5	.54	6	50.5	.88	2	31.0	1.31				183	161.5	.85
4	2	6.0	.41	2	10.0	.48				1	20.0	.58				5	36.0	.53
6	1	1.0	.83	2	10.0	.62	2	20.0	.63							5	31.0	.68
7	11	23.0	.74	8	39.0	1.42	8	66.0	.86	6	93.0	.78	7	357.0	.80	40	578.0	.78
8	2	6.0	.21	3	14.0	.97	6	55.0	.73	2	34.0	.99	1	40.0	1.04	14	149.0	.88
9	8	20.0	1.27	1	5.0	.31	3	27.0	.29	1	12.0	1.20				13	64.0	.77
10	7	14.0	.73	16	76.5	.70	21	184.5	.92	7	118.5	1.17	12	892.0	1.15	63	1285.5	1.08
11							6	54.0	1.19	4	77.0	1.08	4	455.5	1.64	14	586.5	.52
12	2	4.0	.80	4	18.0	.54	8	77.0	.61	8	148.0	.77	7	1239.5	1.11	29	1486.5	1.06
13	2	5.0	.60	1	4.0	1.60	6	58.0	.99	7	128.0	.73	9	396.0	.79	25	587.0	.79
Weighted average			.81			.82			.79			.87			1.06			

1/ Size designations do not include maximum figure; i.e. "0 to 3 acres" does not include 3-acre units, "3 to 5 acres" includes 3-acre but not 5-acre units, etc.

FOR APPENDIX TABLES "L" to "O"
SEE STATE OF CALIFORNIA, DEPT.
OF PUBLIC WORKS BULLETIN #8 -
"COST OF WATER TO IRRIGATORS IN
CALIFORNIA," and BULLETIN #36 -
"COST OF IRRIGATION WATER IN
CALIFORNIA."

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